Topic: Force and Pressure

Force: Any push or pull is called force. Force is a vector quantity i.e. it has magnitude as well as direction. It is measured in Newton's. Force can be balanced or unbalanced. It is the unbalanced force which makes the objects move.

Three cases arise when two or more forces act on an object:

a. If two or more forces act on an object in the same direction they add up.
b. If two or more unequal forces act on an object in opposite direction, they get subtracted.
c. If equal and opposite forces act on an object, they cancel each other and the net (total) force acting on the object is zero.

Scalar quantity: A physical quantity which has magnitude but no direction is called a scalar quantity. e.g. mass, distance, speed etc

Vector quantity: A physical quantity which has magnitude and direction is called a vector quantity. e.g. displacement, weight etc.

Effects of force: The various effects of force are:

1. Force can stop moving objects.
2. Force can change the state of motion of an object.
3. Force can change the direction of an object. If the force is in the same direction as that of the object, speed increases. If the force is in the opposite direction, speed decreases.
4. Force can change the shape and size of an object.

Types of forces: There are two types of forces:

1. Contact force
2. Non-contact force

Contact force: The forces which need a physical contact between the source of the force and the object are called contact forces. Frictional force and muscular force are examples.

Frictional force: It is a type of contact force which comes into play when there is a relative motion between two objects. The two objects are in physical contact with each other e.g. a ball rolling on ground stops due to frictional force between the ball and the ground.

Muscular force: The force exerted by the muscles of our body is called muscular force. It is a type of contact force i.e. a physical contact is necessary between us and the object e.g. lifting a book from a table or kicking a football etc.

Non contact force: The forces which do not need a physical contact between the source of the force and the object are called non-contact forces. Gravitational/ Magnetic/Electrostatic forces are examples. On contact forces are also known as Action at a distance force.

Electrostatic force: It is a type of non-contact force which exists between the charges at rest. Charges are of two types viz positive and negative. Like charges repel each other while unlike charges attract each other. e.g. A comb rubbed with dry hair can attract small pieces of paper without having a physical contact with the bits.

Magnetic force: It is a type of non-contact force which acts between magnets and magnetic material. This force acts at a distance and can be attractive as well as repulsive. All magnets have two poles, North Pole and South Pole. Like poles repel each other while unlike poles attract each other.

GRAVITATIONAL FORCE: - It is a universal force which is always attractive in nature. It is a non-contact force in which Earth attracts other objects towards itself. It is responsible for rainfall, snowfall, formation of solar system, etc.

Pressure

The force acting per unit area is called pressure. It is a scalar quantity and has wide applications in our daily life.

P= FORCE/AREA

Pressure depends on two quantities… Force and Area. Pressure is directly proportional to force i.e. more the force more will be the pressure. Pressure is inversely proportional to area i.e. more area less pressure and vice versa.

Pressure is measured in Pascal's. 1 Pascal is 1 newton/ 1 metre^2.

1 Pascal is defined as the pressure acting on a body when 1 newton of force acts on 1m^2 of the area of the body. Besides bar, millbar and torr are other units of measuring pressure.

1 BAR = 10^5 PASCAL 1 MILLIBAR = 10^2 PASCAL 1 TORR = 133 PASCAL

APPLICATIONS OF PRESSURE:-

i. Straps of bags are made wider to minimize pressure on our shoulders. Since, pressure force / area, pressure is inversely proportional to area, so making the straps wider reduces pressure.
ii. The tyres of tractor are made broad so as to reduce pressure exerted by tyres on the soil.
iii. The tip of the needle of a sewing machine is pointed so as to reduce the area of contact between the needle and the cloth and hence increase pressure.
iv. It is easier to walk on sand with flat shoes than wearing heels because the area of contact in the first case is more thereby creating less pressure.
v. It is easier to cut things using sharp knife than a blunt one because area of contact for a sharp knife is smaller due to which pressure is more.

LIQUID PRESSURE: - Liquids exert pressure and there are certain properties of liquid pressure.

a. Liquid pressure increases with the increase in depth. This property is applicable in the construction of dams where the base of the dam is made broader to resist high pressure.

b. Liquids exert equal pressure in all directions. Liquid pressure at two points within same vessel at the same depth is same.

c. Liquids transmit pressure.

PRESSURE EXERTED BY CASES:-

All gases like hydrogen, helium, etc. exert pressure. Air is a mixture of gases and hence it also exerts pressure. Pressure due to a gas is because of the collisions occurring between the gas molecules and the walls of the container. E.g. when we blow air in a balloon, it inflates due to pressure exerted by the air molecules on the walls of balloon. Similarly air pressure is responsible for the inflation of the vehicles.

ATMOSPHERIC PRESSURE:-

The pressure exerted by the atmosphere of the earth is called atmospheric pressure. The atmosphere extends up to 300 km and includes various layers like stratosphere, troposphere, etc. The upper layers of the atmosphere exert pressure on the layers below them. The atmospheric pressure is maximum at sea level. Its value is 101.3 Pascal or 760mm of hg. The earth's gravitation pulls the atmospheric layers towards itself due to which the lower atmospheric layers are denser than the upper ones.The upper layers of the atmosphere exert lesser atmospheric pressure than the lower ones. Our body does not feel atmospheric pressure because it is exactly counter balanced by the blood pressure of our body.

APPLICATIONS OF ATMOSPHERIC PRESSURE:-

1. *Drinking water through straw*: - We are able to drink water due to atmospheric pressure. When we suck through the straw, pressure in the straw decreases but the pressure over the liquid is high andis equal to atmospheric pressure. Due to this difference in pressure, water is forced into the straw.

2. *Rubber dropper*: - It also works due to atmospheric pressure. When we press the dropper, air inside the dropper comes out in the form of bubbles in liquid. Due to atmospheric pressure, liquid is forced into dropper.

3- *Syringe*: - Liquid is filled in the syringe with the help of atmospheric pressure. When the syringe is pumped, air is forced out of it. Due to more air pressure on the liquid surface, liquid is sucked in. Fountain pens are refilled in the same way.

4. *Rubber sucker*: - It is a device which gets stuck to wall firmly. It is a hemispherical device, which when stuck with the wall has a vacuum (partial vacuum) created within it. Since atmospheric pressure outside is high it pushes it with great force. Due to this force, rubber sucker remains attached to the walls. It can be used as hanger in shops or homes.

Textual Questions (Answers only):

1. The two examples in which we push or pull to change the state of motion are:-
   a. We can stop a moving ball by placing our hand in its path.
   b. We can set a tyre in motion or increase its speed by pushing it in the direction of motion.
2. The two examples in which applied force causes a change in the shape of an object are:-
   a. By pressing a lump of dough on a plate.
   b. By hanging a rubber band suspended from a hook fixed on a wall.
3.
   a) Apply force (pull)
   b) Attract
   c) Push
   d) Repel

4. a) Shape (b) Muscular (c) Contact (d) Gravity and friction
5.

Agent exerting force	*Object on which force is exerted*	*Effect of force*
Force is exerted by our fingers	On lemon	The shape of lemon changes
Fingers	On toothpaste	The shape again changes
Suspended load	Spring	The spring gets deformed
The athlete	On the ground	The muscle gets stretched and compressed

6. A blacksmith hammers a hot piece of iron while making a tool in order to shape up the piece of iron. Here the muscular force exerted by the blacksmith changes the shape of the piece of iron and he can make tools of it.
7. When we rub a balloon with a piece of cloth, both the balloon and the cloth gets charged, so the balloon gets sticked to the wall due to the charge on the balloon, hence it is an example of electrostatic force.
8. Gravitational force and muscular force are the two forces which act on the bucket. These forces don't change the state of the bucket because they are in balanced condition, hence the bucket doesn’t change the state of the bucket because they are in balanced condition, hence the buckets don’t move.
9. The two forces acting on the rocket are gravitational force and friction due to air.
10. Atmospheric pressure.

Friction

Friction:- It is the force which opposes the relative motion between the two surfaces in contact and it acts on both the surfaces. In other words, force of friction can be defined as a negative force which opposes the motion of a body. It is a contact force i.e. it comes into being when there is a physical contact between the two bodies. e.g. A rolling ball comes to rest after sometime because of the frictional force. Frictional force is more for a rough surface as compared to a smooth surface and depends on the nature of surfaces, in contact but is independent of the area of contact.

Friction and its cause:- When we roll a ball on the ground or slide one body over the other, frictional force comes into being to oppose the motion of the object. As every object has certain irregularities or deformations on its surface and when we apply force on one body to slide it upon another body, its interlocked irregularities oppose the applied force, which appear to us in the form of friction. That is why a sufficient amount of force has to be applied before one body starts sliding upon another body, it is the same reason: force of friction is more for a rough surface as compared to a smooth surface.

Types of friction:- There are three main types of friction. These are:-

Static friction:- Its that type of friction which come into being when two non-moving bodies are in contact with each other. It does not allow two bodies to slide upon one another because of the interlocked irregularities. In order to move a body, static friction has to be over come.
Limiting friction:- Its the maximum static friction. If we go on increasing the applied force, the force of friction goes on increasing till we arrive at a stage when the body is just on the point of moving. This stage is called as limiting equilibrium and the force of friction in this case is called as limiting friction.
Dynamic or kinetic or sliding friction:- It's the frictional force when the surfaces in contact are in relative motion. It is slightly less than the limiting friction because more force is required to unlock the irregularities of two stationary bodies as compared to two sliding or moving bodies.
Rolling Friction:- It's the friction which came into being when we roll a body over a surface by means of roller or a wheel. Under similar conditions, rolling friction is much less than sliding friction. Therefore, its easier to roll a given object than to slide it. Due to rolling friction, the surface gets deformed for a short period of time i.e. the time up to the surfaces are in contact with each other and also the roller or the wheel gets deformed too. Due to the deformations produced, an inclined plane is formed and we have to apply the force in order to overcome this temporary inclined plane. And here the applied force gives us the measure of rolling friction. Thus, rolling friction depends on the elevation at the point of contact e.g. Roller skates have tiny wheels. These wheels have very small rolling friction and help in fast motion of the skater.
Laws of Limiting Friction
Limiting friction always opposes the motion of a body and acts in the direction opposite to the direction of applied force.
Limiting Friction depends upon the nature of surfaces in contact with each other.
Limiting friction increases with the increase in the weight of the body and vice versa.
Limiting friction is independent of area of contact between two surfaces: provide the weight of the body and the nature of surface docs not change.
Friction produced in liquids and gases:-
Liquid 'molecules also oppose the relative motion of its molecules and the opposition offered by liquids is called liquid resistance or simply viscosity, it is noted that when solid moves in a liquid or gas, it also experience friction.
example, the bodies of fishes, aeroplanes are streamlined, body which helps them in reducing the force of friction produced by air or water, called drag when they move through them.
While as the friction offered by air is called air resistance. The resistance offered by air depends on the surface area of the body. More the surface area of the body more will be the friction experienced and vice versa. Example, the body of birds is designed in such a way that air offers least resistance to them and hence they can fly with ease.
Ways to produce friction:- As friction opposes motion and causes wear and tear of the moving parts of machines, therefore we regard it as a curse and often try to minimize. Following are the methods applied for reducing friction:-
By using lubricant:- Lubricant is a substance used to reduce the friction. It comes between the two surfaces and hence the interlocking of the irregularities is greatly reduced which in turn reduces the friction.
By using soap solutions:- Soap solution s are slippery in nature. They are used in reducing friction

in high speed cutting and grinding machines, so that not only friction is reduced, but the heat produced during cutting or grinding is rapidly taken away by water present in the soap solution.
By using fine powders:- Graphite is a very soft solid which can be grinded to a very fine state. It is then used as a lubricant in those of parts of machinery, where oil cannot be applied. It fills up irregularities between the surfaces and hence, reduces friction. Similarity, finely powdered talcum is used as a lubricant.
By polishing: - When the surfaces are highly polished, the irregularities are knocked out. This inturn reduces friction.
By streamlining:- The air or water offers a large friction to the bodies moving in them. However, the surface of such bodies is so designed that friction due to air and water is reduced to a large extent. Giving a shape to the bodies, such that they offer the least resistance to the air or water is called streamlined. Modern aircraft's, boats and ships are streamlined so as to reduce friction as far as possible.
By converting sliding friction into rolling friction:- It has been found that rolling friction is about 10 times less as compare to sliding friction between the two surfaces. It is for the same reason, many heavy objects, such as suit cases are provided with small wheels, commonly called rollers. The roller reduces friction and hence, suit case can be moved easily.
Friction:- *A Boon*:- As force of friction always opposes motion, it is always considered as a curse. This is not so because very often the force of friction is also a Boon or a necessary evil. Friction is desirable in many ways as:-
i) In an effort to walk, we push the earth backward. In return the earth pushes us forward and we are able to walk. On a highly polished floor, there is a very little grip between the floor and our shoes due to lack of friction. And also the corrugations on the soles of our shoes help us to increase the frictional force between our feet and the ground.
ii) The treads or corrugations on the tyres increases friction and provide them with a better grip on the road.
iii) Further we use friction while applying brakes to our bicycle. When we apply brakes to our bicycle, we are actually clamping rubber blocks against the revolving rim of the wheel. The resulting friction stops the movement of the wheels.
iv) The lighting of a match stick is due to the force of friction. The force of friction raises the temperature of match head to such an extent, that the chemicals in it catch fire to produce flame.

1. *What do you understand by the term friction? Explain how it is caused.*
   a. The force acting along the two surfaces in contact which opposes the motion of one over the other is known as the force of friction or frictional force. Friction is caused due to presence of irregularities which are found on the two surfaces in contact with each other. It is due to the interlocking of irregularities of the two surfaces that produce friction between them. The frictional force increases with the increase in roughness of the surfaces.
2. *Distinguish between static friction and dynamic friction?*
   a. *Static Friction*:- The friction that exists between the two surfaces in contact when there is no relative motion between them is called static friction. It is self adjusting force, that is only as much as is necessary to prevent the motion.

b. *Dynamic Friction*:- The force of friction acting between two bodies when they are sliding upon one another with a uniform speed is called dynamic friction or sliding friction.

3. *What is limiting friction? state the laws of limiting friction?*
   a. The maximum force of friction when the body just beginning to move is known as limiting friction. Laws of limiting friction:-
      i. Limiting friction always opposes the motion of a body and acts in the direction opposite to the direction-of applied force.
      ii. Limiting friction depends upon nature of surfaces in contact with each other.
      iii. Limiting friction increases with the increase in the weight of the body & vice-versa.
      iv. Limiting friction is independent of area of contact between two surfaces provided the weight of the body and the nature of surface does not change.
4. *How is rolling friction caused?*
   a. The friction experienced by a body, when it is made to move over bodies like roller or a wheel is called rolling friction.

Cause:-

The lower surface of the roller or the wheel gets deformed due to the weight of the rolling object causing depression at the point of contact, because of this deformation (change in shape) of the wheel or roller, a kind of inclined plane is formed. Thus, a force is required to overcome these continuously forward moving inclined planes. This force applied against the continuously forward moving inclined plane is equivalent to the rolling friction.

5. *Under what conditions the rolling friction increases?*
   a. The rolling friction increases with the increase in depth of depression formed as a result of deformation of the wheel or roller.

1. *State one way of increasing the friction between two surfaces?*
   a. The friction between two surfaces can be increased by making surfaces rough. This can be done by making grooves in the surfaces e.g, tyres or rubbing two surfaces with sand paper to make them rougher.
2. *Name four ways by which friction can be reduced between two surfaces in contact?*
   a. The four ways by which friction can be reduced between two surfaces in contact are:-
      i. By the use of lubricants
      ii. By using soap solution
      iii. By polishing
      iv. By using powder
      v. By streamlining
3. *State two advantages of friction.*
   a. The two advantages of friction are:-
      i. We will be unable to walk if there is not friction between soles of our shoes and the ground, it is because when we push the ground backward, the ground reacts back only on account of friction. If there is not friction, then there will be no reaction from, the ground in forward direction, & hence we slip & fall

down.

ii. It is the force of friction which holds the screws & nails in the wood.

4. *State two disadvantages of friction.*
   a. The two disadvantages of friction are:-
      i. Friction increases the energy required to operate the machines. This energy is wasted in the form of heat energy.
      ii. Friction causes wear & tear in the machines & renders them inoperable.
      iii. Friction reduces the speed of moving vehicles to a great extent.
5. *Why is friction called necessary evil?*
   a. Friction is rightly called necessary evil because it has got advantages as well as disadvantages i.e. on one side it is necessary & in another side has got evil characters.
6. *What is lubricant?*
   a. A lubricant is a substance which, when applied between two surfaces in contact, reduced the force of friction between them e.g. oil, grease or graphite powder.

   How does a lubricant reduce friction?
   a. The lubricant fills the minute unevenness of the two surfaces and separates them by forming a very thin layer in between.

   What kind of lubricant is used in i. sewing machine ii. the axle of a tractor?
   a. Lubricant used in sewing machine is less viscous oil.
      Lubricant used in axle of a tractor is grease or more viscous oil.
7. Name two solid lubricants & state where they are used?
   a. The two solid lubricants are graphite & Fine powder. Graphite is used for heavy parts of machine where oil cannot be applied. Where as Fine powder on the carrom board so as to reduce friction between the carrom board & the coins.
8. What do you understand by the term stream lining? Name a few machines which use stream lining to reduce friction?
   a. In order to reduce the friction due to air & water the bodies are given special shape or design e.g. ships, air-crafts, boats and cars are broad in the middle & narrow in front & at the back, such a process is called stream lining.
9. Why is friction called a preserve force?
   a. As friction has evil character but it is absolutely necessary for carrying out day to day activities. So it is both as a friend as well as foe. This is the reason why it is called preserve force.

Answer the following question:-

i) Why are the worn out tyres discarded?
   a. The worn out tyres from which grooves are discarded, as they slip on the roads & can cause serious accidents.

ii) Why do carrom coin move faster on carrom board, When dusted with talcum powder?
   a. When talcum powder is dusted on carrom board it fills up irregularities between the surfaces & makes the surface smoothers, thus reducing friction, resulting in the fast movement of carrom coin.

iii) Why is the surface of conveyor belt made rough?
   a. The surface of-the conveyor belt used for turning pulleys & wheels in factories are made rough so that they could provide the necessary reaction, and wheel could turn about their axles.

iv) Why the sewing machine is often oiled?
   a. The sewing machines are often oiled in order to reduce friction. The lubricant separates the two surfaces in such a way that the interlocking of irregularities are greatly reduced as the spaces between them are filled with lubricants (oil).

v) Why do new automobile tyres have deep grooves?
   a. Automobile tyres have deep grooves so as to offer the required amount of friction. This prevents from slipping & sliding of wheel on the road.

vi) Why does a ball rolling on the ground slow down?
   a. The ball rolling on the ground slow down due to force of friction offered by air and between the ball and the ground, the two forces together oppose the forward movement of the ball.

vii) Why are boats & aeroplanes given spherical shape?
   a. (Already discussed above).

viii) Why do meteors burn on entering into the atmosphere?
   a. The meteors (shooting stars) enter the atmosphere of the earth at a very very high speed. At such speeds the-friction due to air is extremely high. Due to this high friction the temperature of meteor rises to such a high degree that they catch fire.

ix) Why do painters use sand papers in polishing doors?
   a. The painters use sand paper in polishing doors so as to make surface smooth & break the projections on the surface. This makes the surfaces frictionless & glossy.

x) Why is it easier to tie a knot with cotton string as compared to silk string?
   a. Knots are possible only when material offers some friction. As the cotton offers more friction than silk, that is why it is easier to tie a knot with cotton string as compared to silk string.

Qno.2 Fill ups

Do it yourself

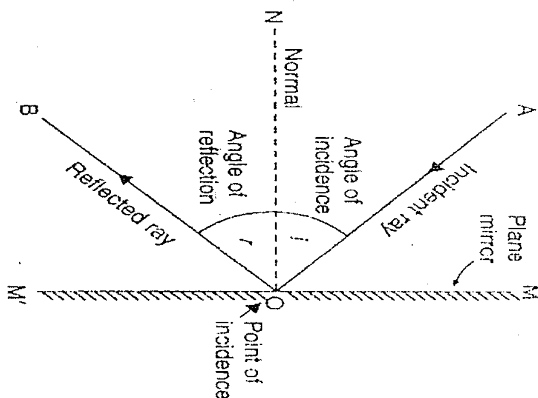
Qno.3 Correct the statements:-

1. Sliding friction & slightly more than the limiting friction.
   a. Sliding friction is slightly less than the limiting friction.
2. The conveyor belts are made rough, in order to decrease friction.
   a. The conveyor belts are made rough in order to increase the friction.
3. The friction between two surfaces decreases with increase in the weights of a body.
   a. The friction between two surfaces increases with the increase in weight of a body.
4. The friction offered by the wheels is called sliding friction.
   a. The friction offered by the wheels is rolling friction.
5. The friction increases with the increase in the area of contact at the two surfaces.
   a. The limiting friction is independent of the area of contact of surfaces.

Topic: Light

Light:- Light is a form of energy that produces in us the sensation of sight. Without light energy the eyes are of no value to us. It is only when light from an object enters our eyes that we see the object. The light may have been emitted by the object or may have been reflected by it. Light may be also defined as the electromagnetic wave travelling with the speed of 3×10^8m/s.

Reflection: - The phenomenon of bouncing back the light rays when it fails on the surface of the object is called reflection of light. It is also defined as the change in the direction of light rays when they strike any surface.



Incident Ray: - The ray of light which comes from the source of light is called as incident ray. In the above figure AO is incident light ray.

Point of incidence:- The point where the incident ray strikes the polished surface is called point of incidence, in the fig. point "O" is the point of incidence.

Reflected ray: - The ray that comes back from the surface after reflection is known as reflected ray. in the figure, ray OB is reflected ray.

Angle of incidence:- The angle that the incident ray makes with the normal drawn to mirror surface at the point of incidence is called angle of incidence (i) In the figure <AON is the angle of incidence.

Angle of reflection: - The angle that the reflected ray makes with the normal drawn to mirror surface at the point of incidence is called angle of reflection. In the figure, <BON is the angle of reflection.

Normal:- The perpendicular drawn to the mirror surface at the point o f incidence is called normal. In the figure ON is the normal to the mirror.

Laws of Reflection

The two laws of reflection of light are stated as: -

1. The incident ray, the refracted ray and the normal drawn to the mirror at the point of incidence all lie in the same plane.
2. The angle of incidence equals the angle of reflection i.e. <i = <r.

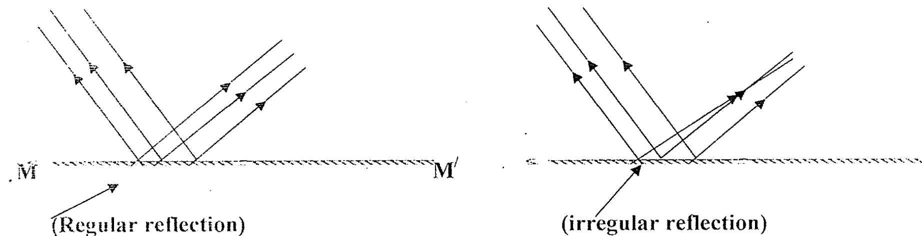
Types of Reflection

Reflection can be classified into two types as:

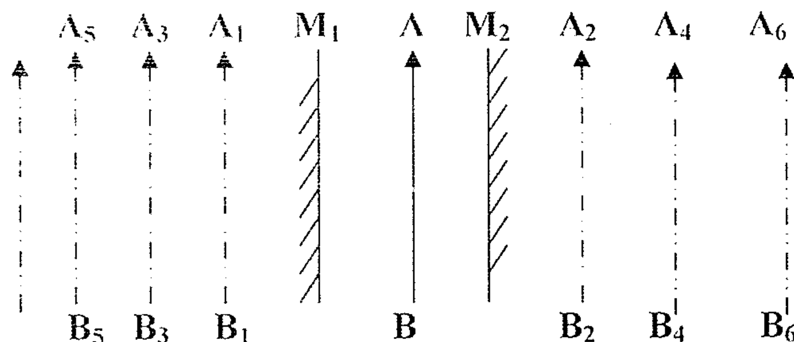
1) Regular reflection 2) Irregular or diffused reflection

1) *Regular reflection*:- It may be defined as that type of reflection which takes place on a .smooth and well polished surface on which the parallel rays of light beam are reflected as parallel rays of light.

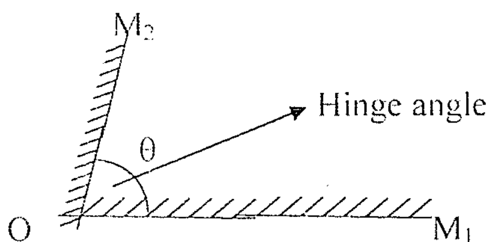
2} *Diffused reflection*:- !t may be defined as that type of reflection which takes place on rough or irregular surfaces on which the parallel rays of light beam are reflected as non-parallel rays of light.



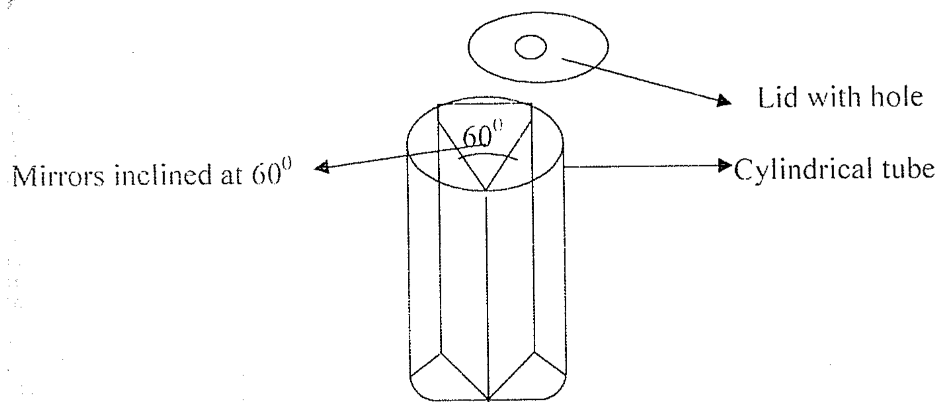
Multiple Images:- The number of images formed of an object held between two mirrors is due to the multiple reflection of light taking place between the two or more mirrors. Consider an object (AB) placed between two mirrors M_1 and M_2. The mirrors M_1 and M_2 form the images of the object say A_1B_1 and A_2B_2. Now.A_1B_1 and A_2B_2 act as objects for M_1 and M_2 and they form their images as A_3B_3 and A_4B_4 and this



whole process of multiple reflection is repeated and in this way a number of images of object AB are formed. The number of images formed of an object by the two plane mirrors also depends on hinge angle i.e. angle between the edges of two mirrors.. For example, when the hinge angle is 90' the number of images formed is 3 and when the angle is 60° numbers of images formed is 5.

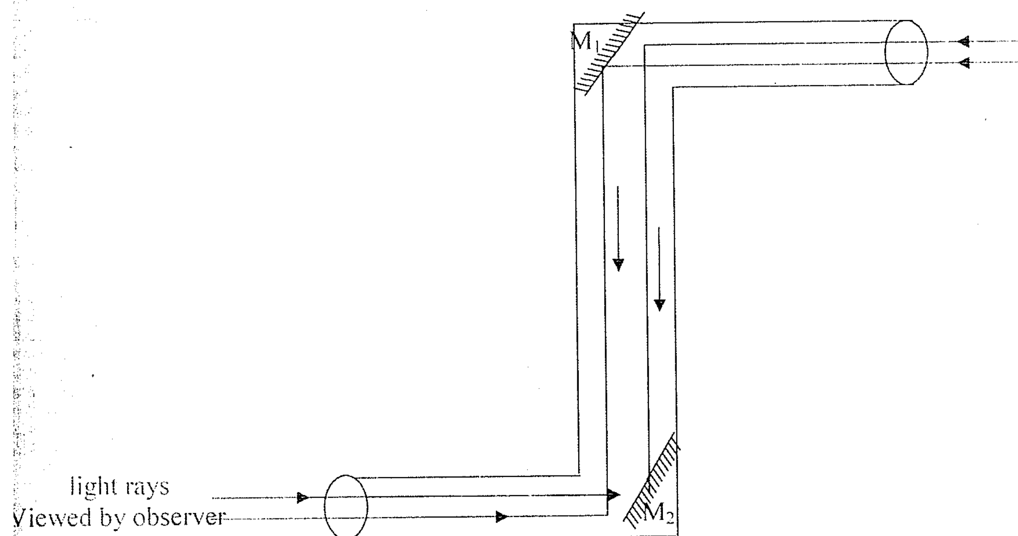


The phenomenon of multiple reflections is employed in periscopes and kaleidoscope.
Kaleidoscope:- Kaleidoscope is a device based on the principle of multiple reflections in inclined mirrors. It consists of three plane mirrors inclined at an angle of 60° to each other. This arrangement of mirrors is kept in a cylindrical box that has few pieces of colored glass at one end. When viewed through a hole from the other end, beautiful patterns could be seen due to multiple images of glass pieces formed by the mirrors. Designers of wallpapers and fabrics and artists use Kaleidoscopes to get ideas for new patterns.



Kaleidoscope

Periscope:- Periscope is another device making use of multiple reflections by plane mirrors. This device is used to see objects which are not in the direct line of sight. They are used in submarines, tanks and also by soldiers in bunkers to see things outside. Figure below shows the arrangement and working of a Periscope.



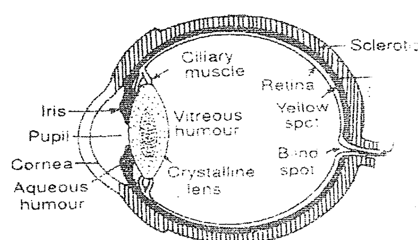
Periscope

1. *Give the structure and working of the human eye.*
   a. The eyes are sense organs that give human beings and most other animals the most and detailed information about their surroundings. Our eye is the most important optical instrument. The main parts of the human eye are: -
      i. *Sclerotic*: - The outer layer or coating of the eye is called sclerotica or sclera. It is opaque. It is made of white tough fibrous tissue. Its function is to protect vital internal parts of eye.
      ii. *Cornea*: - The front bulging part of the eye is called cornea. It is transparent in nature. Its function is to act as a window to the world i.e., to allow the light to enter in the eye ball. Its refractive index is 1.336.
      iii. *Choroid*: - It is a grey membrane attached to the Sclerotic from inner side. Its function is to darken eye from inside and hence prevent any internal reflection.
      iv. *Optic nerve*: - It is a bundle of approximately 70,000 nerves originating from brain and entering eye ball. Its function is to carry optical messages (visual messages) to brain.
      v. *Ciliary muscles*: - It is a ring of muscles. It has a rich automatic nerve supply. Its funclion is to alter the focal length of crystalline lens.
      vi. *Suspensory ligament*: - it is attached with the ciliary muscle and it helps to hold the lens in position.
      vii. *Iris*: - Beyond th ciliary body, there is a circular shelf-like diaphragm suspended in front of crystalline lens is called Iris. It has a hole in the middle called as pupil. The Iris adjusts the size of the pupil according to the intensity of light received by the eye. This is done by increasing or decreasing the diameter of the pupil.
      viii. *Crystalline lens*: - It is a double convex lens made up of a gelatinous transparent substance, it is held in position with the help of ciliary muscles. The focal length of the lens can be changed by the action of ciliary muscles.
      ix. *Vitreous Humour*: - It is a dense jelly like fluid filling the part of eye between lens and the retina. Its function is
         (i) to prevent eye ball from collapsing due to atmospheric pressure
         (ii) in focusing rays clearly on retina.
      x. *Aqeous Humour*:- It is a watery, saline fluid, filling the part of eye between cornea and lens. Its function is
         (i) to prevent from part of the eye from collapsing due to change in atmospheric pressure, (ii) to keep the cornea moist.
      xi. *Retina* or Neuro-sensory tunic:- This is the innermost, thinnest and

softest, but most complicated tunic of an eye ball. It is behind the eye lens and at the dark part of the eye. The retina has a large number of light sensitive cell (about 125 million), which get activated upon illumination and produces electrical signals which are sent to the brain through optic nerves.

xii. *Blind spot*:- The region where the optic nerves enter the eye is called blind spot. This region does not have light sensitive cells and hence image formed on this spot is not visible.

xiii. *Yellow spot*:- The most sensitive part of the retina opposite to pupil is called yellow spot which has (he maximum concentration of the light sensitive cells. It is slightly yellow in colour and its function is to form a very clear image by sending a large number of optical pulses to brain.



Working of the eye:- When light rays reflected back by an object fall upon an eye. these pass through cornea, aqueous humour, lens and vitreous humour before entering the retina. Being transparent, all these parts of an eye function as its transparent refractory media for refracting the light rays. The greatest refraction is done by cornea and next by the lens. The eye lens is a convex lens, so it converges the light rays and produces a real and inverted image of the object on the retina. The sensation of the image formed on the retina is carried to the brain by fibres of optic nerve system. The nerve centres of sight analyze and co-ordinate these impulses and translate the inverted image into the erect one. Thus it is the brain and not the eye that is responsible for seeing.

Function (OR) Role Of Iris And Pupil:

The Iris acts as a shutter which controls the amount of light entering into the eye by adjusting the size of the pupil. If the amount of light entering into the eye is large the Iris contracts and decreases the size of the pupil so that required amount of light enters the eye. If the amount of light entering into the eye is small the Iris expands and increases the size of the pupil so that required amount of light enters into the eye. The adjustment of the aperture of pupil by the Iris takes sometime and is not abrupt hence we feel the glare when we come from a dark room into brighter surroundings.

Perception of colours:-

The retina in an eye consists of large number of light sensitive cells. The rod shaped cells respond to the intensity of light (brightness) and are composed of a protein called Rhodospin. The cone shaped cells respond to colours i.e. help us in distinguishing various

colours and are composed of a protein called iodopsin.

Q) What is accommodation of an eye?

Ans. The ability of an eye to focus the distant objects as well as nearby objects on the retina by changing the focal length of the lens with the help of ciliary muscles is called accommodation of any eye.

When the eye is looking at a distant object, the ciliary muscles contract and the eye lens becomes thin due to which its focal length increases and it can form the image of the distant object on the retina. The eye is said to be un-accommodated or at rest.

On the other hand, when eye is looking nearby objects, the ciliary muscles are then fully strained and the eye lens becomes thick due to which its focal length decreases and it can focus the nearby objects on the retina. The eye is said to be fully accommodated.

Textual questions (Answers only)

1. No, we cannot see objects in the room as there is no light which could have illuminated the objects in the room. Yes, we can see objects outside the room provided they are illuminated by the light source.

2.

Regular reflection	Diffused reflection
Light rays get reflected in a well defined direction.	Light rays do not get reflected in a well defined direction.
It takes place on smooth and well polished surfaces.	It takes place on rough surfaces.
It displays an ordered pattern of light ravs.	It displays a disordered pattern of light rays.

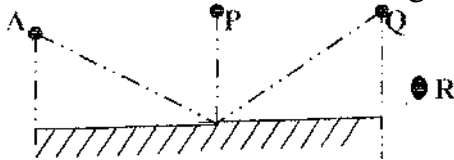
3.
   a. Regular reflection as surface is smooth and polished.
   b. Diffused reflection as surface is rough.
   c. Diffused reflection as surface is rough..
   d. Regular reflection as surface is smooth.
   e. Regular reflection as surface is highly polished one.
   f. Diffused reflection for ordinary paper and regular reflection for high quality paper.

Do Q6 to Q 11 yourself.

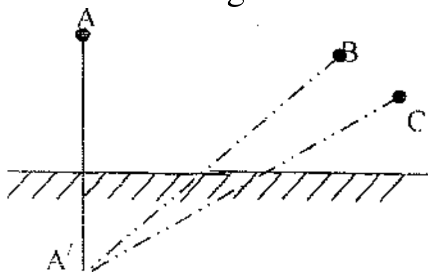
12)
a) Do not look at the sun or a powerful light directly.
b) If advised, us spectacles..
c) Too little or too much light is bad for eyes. Insufficient light causes eyestrain and headaches.
d) Too much light like that of the sun, a powerful lamp or laser torch can injure the retina.

e) Never rub your eyes and if some foreign body gets into the eyes first wash your eyes if this doesn't work then consult a doctor.
f) Wash your eyes frequently with clean water.
g) Always read at the normal distance for vision.

16) Yasir cannot see his image in the mirror because he is standing outside the edge of mirror. He can see the images of P and Q bin not the image of R.



17)
a. The image of A in mirror will be as for behind as the object in front of mirror
b. Yes
c. Yes
d. The image of A will not move forward.



Topic: Some Natural Phenomenon

Introduction:- Some natural phenomenon cause a lot of damage and destruction to human life and property. These include cyclones, volcanoes, tsunami storms, earthquakes and lightning. We will discuss two destructive natural phenomenon lighting and Earthquakes. For understanding lightning we should know about electric charges because lightning is an electric spark on a huge scale which is caused by the accumulation of electric charges in the clouds.

Electric Charge and Its Discovery:- Electric charge is a property of matter which is responsible for electrical phenomena. Electric charges exist in two forms: Positive electric charge and Negative electric charge.

It was about 2500 years ago, a Greek scientist called Thales observed that when a material known as "Amber" was rubbed with a silk cloth, it started attracting tiny feathers. Amber was actually a hardened translucent yellow brown solid secretion of certain trees. In 1600 Dr William Gilbert discovered that things like glass, diamond, wax when rubbed with a cloth, showed the same properties as amber. Thus he coined the terms like

electric and electricity. Gilbert is called the "Father of Electricity'. The existence of electric charges can be shown by performing simple activities like:

i) Rubbing a plastic comb with dry hair, makes the comb charged which can then attract bits of paper.

ii) Rubbing a glass rod with a silk cloth, makes the rod charged which enables it to attract pieces of paper.

iii) Rubbing a balloon with woolen cloth also produces similar effect.

While such activities are done, a kind of force which can attract as well as repel objects gets developed. This force is called electrostatic force. The charges here remain stationary on the charged body and hence are called static charges. Thus, a body having electric charge on it is called a charged body and if this charge is not allowed to flow, it is called static electricity.

Q) How do objects get charged (Modern Electronic Theory of Electrification)?

In order to understand the nature of electricity, we need to understand the matter:-

i) All matter is made of tiny particles known as atoms. An atom consists of 3 rub particles-protons.

electrons and neutrons.

ii) A proton carries a positive charge, an electron carries a negative charge and the neutron has no charge.

iii) The central part of an atom is the nucleus which contains protons and neutrons. The electrons revolve around the nucleus in circular paths called orbits or shells.

iv) The electrons present in the outermost orbit are called valence electrons. These can be removed or transferred easily, from one atom to another.

v) The transfer of electrons is responsible for charging of bodies.

vi) In an atom, the no. of protons are equal to no. of electrons. An atom is electrically neutral.

vii) When an atom gains electrons there are excess of negatively charged electrons than protons. Hence the body is said to be negatively charged.

viii) When an atom loses electrons there is deficiency of electrons than protons. Hence the body is positively charged.

ix) Atoms carrying electric charge are called ions.

x) Ions are electrically charged particles and are surrounded by an electric field.

xi) Charged particles exert a force on one another, even when they are not in physical contact because of their electric field.

Thus, it is the movement of electrons from one atom to another, which causes a body to get charged. When a glass rod and a piece of silk cloth are rubbed against each other, the glass rod loses electrons to the silk cloth because the electrons in the outermost orbits of glass rod are loosely bound as compared to those in the silk cloth. Now the glass rod has a deficiency of electrons and is positively charged while the silk cloth has excess of electrons and hence is negatively charged.

Similar is the process due to which other bodies like balloon, comb etc. get charged.Whether an object will electrons or gain electrons during rubbing depends on the nature of the object. The materials like glass, woolen cloth, hair and ball pen refill lose electrons more easily and hence get positively charged on rubbing. !n the other hand, the materials like silk, rubber, balloon, plastic comb, polythene gain electrons more easily and hence get positively charged on during rubbing.

Interaction of Electric Charges:

There are two types of charges:- Positive charges and negative charges. A positive charge repels another positive charge, but a positive charge attracts a negative charge. Thus, it can be concluded like charges attract each other and unlike charges repel each other.

Many times when we take off woolen or synthetic clothes (like polyester and nylon clothes), our body hair stands erect on their ends. This is because rubbing (or friction), while taking off these clothes, charges the body hair with the same kind of electric charge. Due to their like charges, the body hairs repel one another. This repulsion makes the body hair stand erect.

1. *When a charged glass rod (rubbed with silk) is brought near a charged plastic straw there is attraction between the two. What is the nature of charge on the plastic straw?*
    a. Since the charge present on a glass rod (rubbed with silk) is said to be positive. There can be attraction between a charged glass rod and a charged plastic straw is negative.
2. *Why a charged objects attracts an uncharged object?*
    a. A charged object attracts an uncharged object by electric induction. As an example, we will explain how a charged plastic comb attracts an-uncharged piece of paper. Suppose a negatively charged plastic comb is held over a small piece of paper. Suppose a negatively charged plastic comb is held over a small piece of paper. The negatively charged plastic comb produces opposite charges (positive charges) in the top end of paper (which is nearer to it) by electric induction. This is because negative charge of plastic comb repels the electrons from the top side of paper to its bottom side leaving the top side of the paper positively charged. The plastic comb has negative charge and the top of paper has now positive charge. The attraction between

opposite charges (negative charge on plastic comb and positive charge on top of paper) results in the paper being attracted by the plastic comb.

Electroscope:- An electroscope is a device for detecting electric charge on an object. By using an electroscope, we can tell whether an object is electrically charged or not. It was the first electrical instrument. It was invented by British physician William Gilbert. It is very sensitive and delicate instrument. The gold leaf electroscope and the pith ball electrosope are the two widely used electroscopes in physics laboratory.

Construction of Gold Leaf Electroscope:-

It consists of a brass rod which passes through an insulator plug in a glass case.The top end of the brass rod carries a brass disc or cap and the lower end carries two thin gold leaves. Thin gold leaves are very delicate and sensitive to detect even a very small charge. The glass case protects the leaves from outside air current. The lower part of the glass case is surrounded by a metal foil from inside. When the electroscope is used the metal foil is earthed. It helps the charge to stay on the gold leaves for a longer time.

Working Of Electroscope:- In order to detect the electric charge on an object, we touch the metal top of the electroscope with their object and observe the leaves of the electroscope. If they diverge (or open up), then the given object has an electric charge on it (or given object) is electrically charged, if on touching the metal top of electroscope with the given object, the leaves of the electroscope do not diverge (do not open up) then the given object has no electric charge on it (it has no electric charge on it or the given object is electrically natural).

If we touch a charged electroscope with our finger, it gets discharged and its leaves collapse. Actually on touching the electric charge present on the electroscope flows to the earth through our hand and body and this is known as Earthing. Thus the process of transferring an electric charge from a charged object to the earth is called earthing. Earthing is provided in the wiring of houses and other buildings to protect us from electric shocks who may occur due to any leakage of electric current from the body of an electrical appliance. Metal wires (called earth wires) are used for this purpose.

Electric Discharge

The passage of electric current in air due to movement of electric charges is called electric discharge. During electric discharge, the positive and negative electric charges cancel out each other and an electric spark and a cracking sound are produced. In nature, electric discharge within a cloud during thunderstorm produces huge electric sparks known as lightning along with a loud sound called Thunder.

Lightning: The electrical phenomena occurring in atmosphere due to transfer of charges from cloud to earth is called lighting.

How Lightning Takes Place:- Lightning is the electric discharge. When air blows from bottom to top in. clouds electric charges are developed due to friction. Clouds are made up of water molecules and dust particles. These molecules are of different sizes. When air blows, the molecules of cloud are rubbed against each other and because of these bigger

molecules get negative and small molecules get positive charge. Due to mass difference, small molecules take the top. Positive are big molecules take lower position of the cloud. In this way a cloud (storm cloud) gets charged when the accumulation of negative charges is very much, then the air between the storm cloud and earth is ionized and charges rush down from thunderstorm to earth. While discharging the air is heated up and because of which we see the Hash of light and also air expands and because of which we hear the sound in the form of thunder. In this way, lightning and thunder takes place. The electrical nature of lighting was established by Benjamin Franklin.

Dangers and Protection

Lighting causes great damage and destruction to living organisms including tall buildings and trees. The potential difference created between clouds and earth is $2x10^7$ -10^8 volts and hence is very dangerous.

Following steps help us to protect us from lighting:

1. We should remain inside the house.
2. If travelling remain inside the vehicle.
3. Do not take shelter under big trees.
4. Do not lie on the ground while lightning.
5. We should avoid raising an umbrella over our head.
6. We should switch off our T V sets.
7. We should not touch metal pipes fixed in a house or building.
8. We should stay away from electric poles, telephone poles and other metal objects.
9. Tall buildings should use lightning conductors.

Lighting Conductor:- It is a device used to save buildings from lighting strokes, it consists of a thick metal strip (copper) which is fixed above the highest point of a building. Its upper end is in the form of spikes and lower end is joined with a copper plate which is inside the earth. As the thunderstorm passes over the building, it induces positive charges on spikes and repels negative charges which get accumulated on the metal plate.

The electric energy of the lightning passes through the metal strip and gels discharged safely into the ground. Thus the conductor protects against lightning by conducting the electric energy of lightning into the earth.

Earthquake:- The sudden shaking of earth for sometime due to release of energy inside the earth is called earthquake, it is a natural phenomenon which can't be predicted in advance. This makes the even more dangerous. Due to the release of energy inside the earth, there is a formation of wave which moves through the earth and causes shaking of earth or earthquake.

Q) Why do earthquakes occur?

a. Earthquakes occur due to

i) Sliding of plates ii) Colliding of plates

i) The earth has three main layers core, crust and mantle. The mantle contains solid and

molten dense rocks. Due to convection currents in the mantle, the plates of the crust have very small motion. They are slowly sliding in the opposite directions. This motion creates a lot of pressure on the plates. When the contact points between the plates are broken, a strong jerk is produced causing the release of lot of energy. This energy produces seismic waves which travel through earth causing earthquake.
ii) *Focus*:- The point inside the earth where earthquake originates. Epicenter:- The point above the focus on the surface of earth is called epicenter.
ii) Colliding of plates: - When the two plates collide with each other head on, then the ends of these crust plates buckle and fold forming new mountains and causing earthquake. The zones which are most prone to earthquakes are called Seismic zones.
Seismograph:- It is an instrument which measures and records the magnitude of an earthquake in terms of shock waves it produces. It is also known as Seismometer.
Construction:- It consists of a heavy weight suspended from a support with the help of a strong wire. The support is attached to the base of the seismograph. The base of the seismograph is fixed rigidly to a solid rock on the surface of the earth. A pen is attached to the lower end of the hanging heavy weight. This pen can trace lines on a graph paper wound around a rotating drum which lies beneath it.
Working:- When an earthquake occurs the earth starts shaking due to which the base of seismograph fixed to the earth also starts shaking. But the freely suspended heavy weight and the pen attached to it do not shake during earthquake, they remain stationary. Since the graph paper on the rotating drum shakes with the shaking earth, the pen attached to it records the vibrations produced by the earthquake on a graph paper which moves under it. The record/ graph obtained from a seismograph is called Seismogram.
Richter scale:- The magnitude of an earthquake is expressed on a Richter scale. It is a series of numbers from 1-12 used to express the magnitude of an earthquake. Earthquakes with magnitude greater than 7 are really destructive.
Precautions against Earthquakes:

1. All the houses and buildings in seismic zones should be designed and constructed in a way so that they can with stand major earthquake tremors.
2. Heavy construction material like iron etc should be avoided in seismic zones.
3. Cupboards and shelves should be fixed to the walls so that they do not fail easily.
4. During an earthquake, buildings may catch fire, so fire fighting equipments should be in working order.
5. During an earthquake, take shelter under a table.
6. If we are in car, we should drive it slowly and take it to a clear spot.
7. We should always have a first aid box ready.

Note:- After studying the chapter thoroughly, do not textual questions on your fair note books. Draw a neat and well labeled diagram of:

i) An electroscope

ii) A Seismograph

Textual Questions

1. *Sometimes, a crackling sound is heard while taking off a sweater during winters. Why?*
    a. Sweater is made of wool and there is a constant friction between the sweater and the inner shirt. Because of this friction there occurs transfer of electrons from one body to another. When we take off the sweater, these two bodies attract each other and the passage of electrons through the air in the form of spark let out heat and sound energy. Thus, we hear the crackle sound and in the dark room we may see the spark lights as well.
2. *Explain why a charged body loses its charge if we touch it with our hands.*
    a. When we touch a charged body with our hand, they excess charge present on the body get transferred to the ground through our body. Thus, the charged body loses its charge and becomes neutral.
3. *Name the scale on which the destructive energy of an earthquake is measured. An earthquake measures 3 on this scale .Would it be recorded by a seismograph? Is it likely to cause much damage?*
    a. The destructive energy of an earthquake is measured on Richter scale. Yes, the earthquake of magnitude 3 will be recorded by seismograph, but is not likely to cause much damage. Generally, earthquake of magnitudes higher than 6are considered to be destructive in nature.
4. Suggest three measures to protect ourselves from lightning
    a. We should remain inside the house.
    b. We should switch off our T.V. sets.
    c. If travelling remain inside a vehicle.
5. List three states in India where earthquakes are more likely to strike.
    a. The three states in India where earthquakes are more likely to strike are Jammu and Kashmir, Gujarat and Assam.
6. Suppose you are outside your home and an earthquake strikes. What precaution would you take to protect yourself?
    a. Do not remain under big tree or pole.
    b. We should try to move in an open space.
    c. If you are in a car, remain inside it.
7. The weather department has predicted that a thunder storm is likely to occur on a certain day. Suppose you have to go out on that day. Would you carry an umbrella? Explain.

No, we won't an umbrella in a thunderstorm. It is because thunderstorm is accompanied by lightening and electric discharge from the clouds and it can travel through the metallic rod and this may give an electric shock to a person who is carrying it. Hence, it is not safe to carry an umbrella during a thunderstorm.

8. Describe with the help of a diagram an instrument which can be used to detect a charged body.
    a. It consists of a brass rod which passes through an insulator plug in a glass case. The top end of brass rod carries a basic disc or cap and lower end carries two thin gold leaves. The gold leaves are very delicate and sensitive to detect even a small charge. The glass protects the leaf from outside current. The lower part of glass case is surrounded by a metal foil from inside. When the electroscope is used the metal foil is earthed. It helps the charge to stay on gold leaves for longer time. In order to detect the charge on an object we touch the metal top of an electroscope with that object and observe the leaves of electroscope. If they diverge (or open up), then the object has a electric charge on it (or given object) is electrically charged with the given object, the leaves of electroscope do not diverge (do not open up) then the given object has no charge on it (or the given has no electric charge) on it (Or the given object) is electrically charged.

Textual Questions

1. *Which of the following cannot be charged easily by friction?...........*
    a. Only non-conducting materials can be easily charged by friction. Copper is a highly conducted materials. Therefore, a copper rod cannot be charged easily by friction.
2. *When a glass rod is rubbed with a piece of silk cloth the rod…………..*
    a. The rod becomes positively charged, while the cloth has a negative charge. When an object is charged by rubbing it against another object, the two objects get oppositely charged. By convention, it is considered that the charge acquired by the glass rod is positive and charge acquired by the cloth is negative. Therefore, the rod becomes positively charged and the cloth becomes negatively charged.
3. *Do it yourself*
4. *Sometimes, a crackling sound is heard while taking off a sweater during winters. Why?*
    a. When a sweater is taken off the woolen sweater gets charged because of the friction between the sweater and the body. Hence, one can hear a crackling sound during the given process.
5. *Explain why a charged body loses its charge if we touch it with our hands.*
    a. When we touch a charged object, our body conducts its charges to the earth.

That is why a charged body loses its charge, if we touch it with our hands. This phenomenon is known as electric discharge.

6. *Name the scale on which the destructive energy of an earthquake is measured. An earthquake measures 3 on this scale. Would it be recorded by a seismograph? Is it likely to cause much damage?*
   a. The destructive energy of an earthquake is measured by the Richter scale. This scale has the readings from I to 10.
      The reading of magnitude 3 on the Richter scale would be recorded by a seismograph. If the Richter scale gives a reading of magnitude 3, then the earthquake is not likely to cause much damage. Generally, earthquake of magnitudes higher than 5 is considered destructive in nature.
7. *Suggest three measures to protect ourselves from lightning.*
   a. Protective measures against lightning are as follows:
      i. Stay in a completely closed place. If you are moving in a car, then remain there until the lightning is over. Close the windows of the car immediately.
      ii. Do not touch any electrical wires, telephone cables, metal pipes, etc.
      iii. Do not bath in running water. This may cause an electric shock.
8. Explain why a charged balloon is repelled by another charged balloon whereas an uncharged balloon is attracted by another charged balloon?
   a. The nature of charges present on the surface of charged balloons are similar. Since like charges repel each other, two charged balloons repel each other. When a charged body is brought near an uncharged body, the uncharged body acquires charges on its surface caused by the induction of charges. The charges are of opposite nature in relation to the charged body. Since unlike charges attract each other, a charged body always attracts an uncharged body. Hence, an uncharged balloon is attracted by another charged balloon.
9. Describe with the help of a diagram an instrument which can be use to defect a charged body.
   a. An electroscope can be used to detect whether a body is charged or not. The following figure shows a simple electroscope (fig 17.4 page no. 213). It consists of a metal rod. At one end of the rod, two leaves of aluminium foil are fixed and at the other end. there is a metal disc. The leaves of aluminium foil are placed inside a conical flask and the flask is corked to isolate the leaves from air. When the metal disc is touched with a charged body, the aluminium strips move away from each other. This happens because some f the charges of the body are transferred to the strips through the metal rod. This method of charging a body is called charging by conduction. The nature of charges on both the leaves and the charged body are similar. Hence, both

the leaves of the aluminium foil will move away from each other. If the body was .not charged, then the leaves of the foil would remain as they were before. They would not repel each other.

10. List three stales in India where earthquakes are more likely.
    a. The three states in India where earthquakes are more likely to strike are Jammu and Kashmir. Gujarat and Assam.
11. Suppose you are outside your home and an earthquake strikes. What precaution would you take to protect yourself?
    a. Suppose we are outside your home and an earthquake strikes us some of the precautions taken to protect ourselves are as follows:
        i. Try to find an open field away from tall buildings, installations, tall trees, and electric wires and poles.
        ii. If travelling in a bus or a car then do not come out when an earthquake strikes. Ask the driver in an open field.

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i) Rubbing a plastic comb with dry hair, makes the comb charged which can then attract bits of paper.

ii) Rubbing a glass rod with a silk cloth, makes the rod charged which enables it to attract pieces of paper.

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While such activities are done, a kind of force which can attract as well as repel objects gets developed. This force is called electrostatic force. The charges here remain stationary

on the charged body and hence are called static charges. Thus, a body having electric charge on it is called a charged body and if this charge is not allowed to flow, it is called static electricity.

Q) How do objects get charged (Modern Electronic Theory of Electrification)?

In order to understand the nature of electricity, we need to understand the matter:-

i) All matter is made of tiny particles known as atoms. An atom consists of 3 rub particles-protons.
electrons and neutrons.

ii) A proton carries a positive charge, an electron carries a negative charge and the neutron has no charge.

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v) The transfer of electrons is responsible for charging of bodies.

vi) In an atom, the no. of protons are equal to no. of electrons. An atom is electrically neutral.

vii) When an atom gains electrons there are excess of negatively charged electrons than protons. Hence the body is said to be negatively charged.

viii) When an atom loses electrons there is deficiency of electrons than protons. Hence the body is positively charged.

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Thus, it is the movement of electrons from one atom to another, which causes a body to get charged. When a glass rod and a piece of silk cloth are rubbed against each other, the glass rod loses electrons to the silk cloth because the electrons in the outermost orbits of glass rod are loosely bound as compared to those in the silk cloth. Now the glass rod has a deficiency of electrons and is positively charged while the silk cloth has excess of electrons and hence is negatively charged.

Similar is the process due to which other bodies like balloon, comb etc. get charged.Whether an object will electrons or gain electrons during rubbing depends on the

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It consists of a brass rod which passes through an insulator plug in a glass case.The top

end of the brass rod carries a brass disc or cap and the lower end carries two thin gold leaves. Thin gold leaves are very delicate and sensitive to detect even a very small charge. The glass case protects the leaves from outside air current. The lower part of the glass case is surrounded by a metal foil from inside. When the electroscope is used the metal foil is earthed. It helps the charge to stay on the gold leaves for a longer time.

Working Of Electroscope:- In order to detect the electric charge on an object, we touch the metal top of the electroscope with their object and observe the leaves of the electroscope. If they diverge (or open up), then the given object has an electric charge on it (or given object) is electrically charged, if on touching the metal top of electroscope with the given object, the leaves of the electroscope do not diverge (do not open up) then the given object has no electric charge on it (it has no electric charge on it or the given object is electrically natural).

If we touch a charged electroscope with our finger, it gets discharged and its leaves collapse. Actually on touching the electric charge present on the electroscope flows to the earth through our hand and body and this is known as Earthing. Thus the process of transferring an electric charge from a charged object to the earth is called earthing. Earthing is provided in the wiring of houses and other buildings to protect us from electric shocks who may occur due to any leakage of electric current from the body of an electrical appliance. Metal wires (called earth wires) are used for this purpose.

Electric Discharge

The passage of electric current in air due to movement of electric charges is called electric discharge. During electric discharge, the positive and negative electric charges cancel out each other and an electric spark and a cracking sound are produced. In nature, electric discharge within a cloud during thunderstorm produces huge electric sparks known as lightning along with a loud sound called Thunder.

Lightning: The electrical phenomena occurring in atmosphere due to transfer of charges from cloud to earth is called lighting.

How Lightning Takes Place:- Lightning is the electric discharge. When air blows from bottom to top in. clouds electric charges are developed due to friction. Clouds are made up of water molecules and dust particles. These molecules are of different sizes. When air blows, the molecules of cloud are rubbed against each other and because of these bigger molecules get negative and small molecules get positive charge. Due to mass difference, small molecules take the top. Positive are big molecules take lower position of the cloud. In this way a cloud (storm cloud) gets charged when the accumulation of negative charges is very much, then the air between the storm cloud and earth is ionized and charges rush down from thunderstorm to earth. While discharging the air is heated up and because of which we see the Hash of light and also air expands and because of which we hear the sound in the form of thunder. In this way, lightning and thunder takes place. The electrical nature of lighting was established by Benjamin Franklin.

Dangers and Protection

Lighting causes great damage and destruction to living organisms including tall buildings and trees. The potential difference created between clouds and earth is $2x10^7$ -10^8 volts and hence is very dangerous.

Following steps help us to protect us from lighting:

1. We should remain inside the house.
2. If travelling remain inside the vehicle.
3. Do not take shelter under big trees.
4. Do not lie on the ground while lightning.
5. We should avoid raising an umbrella over our head.
6. We should switch off our T V sets.
7. We should not touch metal pipes fixed in a house or building.
8. We should stay away from electric poles, telephone poles and other metal objects.
9. Tall buildings should use lightning conductors.

Lighting Conductor:- It is a device used to save buildings from lighting strokes, it consists of a thick metal strip (copper) which is fixed above the highest point of a building. Its upper end is in the form of spikes and lower end is joined with a copper plate which is inside the earth. As the thunderstorm passes over the building, it induces positive charges on spikes and repels negative charges which get accumulated on the metal plate.

The electric energy of the lightning passes through the metal strip and gels discharged safely into the ground. Thus the conductor protects against lightning by conducting the electric energy of lightning into the earth.

Earthquake:- The sudden shaking of earth for sometime due to release of energy inside the earth is called earthquake, it is a natural phenomenon which can't be predicted in advance. This makes the even more dangerous. Due to the release of energy inside the earth, there is a formation of wave which moves through the earth and causes shaking of earth or earthquake.

Q) Why do earthquakes occur?

a. Earthquakes occur due to

i) Sliding of plates ii) Colliding of plates

i) The earth has three main layers core, crust and mantle. The mantle contains solid and molten dense rocks. Due to convection currents in the mantle, the plates of the crust have very small motion. They are slowly sliding in the opposite directions. This motion creates a lot of pressure on the plates. When the contact points between the plates are broken, a strong jerk is produced causing the release of lot of energy. This energy produces seismic waves which travel through earth causing earthquake.

ii) *Focus*:- The point inside the earth where earthquake originates. Epicenter:- The point above the focus on the surface of earth is called epicenter.

ii) Colliding of plates: - When the two plates collide with each other head on, then the ends of these crust plates buckle and fold forming new mountains and causing earthquake. The

zones which are most prone to earthquakes are called Seismic zones.
Seismograph:- It is an instrument which measures and records the magnitude of an earthquake in terms of shock waves it produces. It is also known as Seismometer.
Construction:- It consists of a heavy weight suspended from a support with the help of a strong wire. The support is attached to the base of the seismograph. The base of the seismograph is fixed rigidly to a solid rock on the surface of the earth. A pen is attached to the lower end of the hanging heavy weight. This pen can trace lines on a graph paper wound around a rotating drum which lies beneath it.
Working:- When an earthquake occurs the earth starts shaking due to which the base of seismograph fixed to the earth also starts shaking. But the freely suspended heavy weight and the pen attached to it do not shake during earthquake, they remain stationary. Since the graph paper on the rotating drum shakes with the shaking earth, the pen attached to it records the vibrations produced by the earthquake on a graph paper which moves under it. The record/ graph obtained from a seismograph is called Seismogram.
Richter scale:- The magnitude of an earthquake is expressed on a Richter scale. It is a series of numbers from 1-12 used to express the magnitude of an earthquake. Earthquakes with magnitude greater than 7 are really destructive.
Precautions against Earthquakes:

8. All the houses and buildings in seismic zones should be designed and constructed in a way so that they can with stand major earthquake tremors.
9. Heavy construction material like iron etc should be avoided in seismic zones.
10. Cupboards and shelves should be fixed to the walls so that they do not fail easily.
11. During an earthquake, buildings may catch fire, so fire fighting equipments should be in working order.
12. During an earthquake, take shelter under a table.
13. If we are in car, we should drive it slowly and take it to a clear spot.
14. We should always have a first aid box ready.

Note:- After studying the chapter thoroughly, do not textual questions on your fair note books. Draw a neat and well labeled diagram of:

iii) An electroscope
iv) A Seismograph

Textual Questions

9. *Sometimes, a crackling sound is heard while taking off a sweater during winters. Why?*
    a. Sweater is made of wool and there is a constant friction between the sweater and the inner shirt. Because of this friction there occurs transfer of electrons

from one body to another. When we take off the sweater, these two bodies attract each other and the passage of electrons through the air in the form of spark let out heat and sound energy. Thus, we hear the crackle sound and in the dark room we may see the spark lights as well.

10. *Explain why a charged body loses its charge if we touch it with our hands.*
    a. When we touch a charged body with our hand, they excess charge present on the body get transferred to the ground through our body. Thus, the charged body loses its charge and becomes neutral.
11. *Name the scale on which the destructive energy of an earthquake is measured. An earthquake measures 3 on this scale .Would it be recorded by a seismograph? Is it likely to cause much damage?*
    a. The destructive energy of an earthquake is measured on Richter scale. Yes, the earthquake of magnitude 3 will be recorded by seismograph, but is not likely to cause much damage. Generally, earthquake of magnitudes higher than 6are considered to be destructive in nature.
12. Suggest three measures to protect ourselves from lightning
    a. We should remain inside the house.
    b. We should switch off our T.V. sets.
    c. If travelling remain inside a vehicle.
13. List three states in India where earthquakes are more likely to strike.
    a. The three states in India where earthquakes are more likely to strike are Jammu and Kashmir, Gujarat and Assam.
14. Suppose you are outside your home and an earthquake strikes. What precaution would you take to protect yourself?
    a. Do not remain under big tree or pole.
    b. We should try to move in an open space.
    c. If you are in a car, remain inside it.
15. The weather department has predicted that a thunder storm is likely to occur on a certain day. Suppose you have to go out on that day. Would you carry an umbrella? Explain.

No, we won't an umbrella in a thunderstorm. It is because thunderstorm is accompanied by lightening and electric discharge from the clouds and it can travel through the metallic rod and this may give an electric shock to a person who is carrying it. Hence, it is not safe to carry an umbrella during a thunderstorm.

16. Describe with the help of a diagram an instrument which can be used to detect a charged body.
    a. It consists of a brass rod which passes through an insulator plug in a glass

case. The top end of brass rod carries a basic disc or cap and lower end carries two thin gold leaves. The gold leaves are very delicate and sensitive to detect even a small charge. The glass protects the leaf from outside current. The lower part of glass case is surrounded by a metal foil from inside. When the electroscope is used the metal foil is earthed. It helps the charge to stay on gold leaves for longer time. In order to detect the charge on an object we touch the metal top of an electroscope with that object and observe the leaves of electroscope. If they diverge (or open up), then the object has a electric charge on it (or given object) is electrically charged with the given object, the leaves of electroscope do not diverge (do not open up) then the given object has no charge on it (or the given has no electric charge) on it (Or the given object) is electrically charged.

Textual Questions

12. *Which of the following cannot be charged easily by friction?...........*
    a. Only non-conducting materials can be easily charged by friction. Copper is a highly conducted materials. Therefore, a copper rod cannot be charged easily by friction.
13. *When a glass rod is rubbed with a piece of silk cloth the rod…………..*
    a. The rod becomes positively charged, while the cloth has a negative charge. When an object is charged by rubbing it against another object, the two objects get oppositely charged. By convention, it is considered that the charge acquired by the glass rod is positive and charge acquired by the cloth is negative. Therefore, the rod becomes positively charged and the cloth becomes negatively charged.
14. *Do it yourself*
15. *Sometimes, a crackling sound is heard while taking off a sweater during winters. Why?*
    a. When a sweater is taken off the woolen sweater gets charged because of the friction between the sweater and the body. Hence, one can hear a crackling sound during the given process.
16. *Explain why a charged body loses its charge if we touch it with our hands.*
    a. When we touch a charged object, our body conducts its charges to the earth. That is why a charged body loses its charge, if we touch it with our hands. This phenomenon is known as electric discharge.
17. *Name the scale on which the destructive energy of an earthquake is measured. An earthquake measures 3 on this scale. Would it be recorded by a seismograph? Is it likely to cause much damage?*
    a. The destructive energy of an earthquake is measured by the Richter scale. This scale has the readings from I to 10.

The reading of magnitude 3 on the Richter scale would be recorded by a seismograph. If the Richter scale gives a reading of magnitude 3, then the earthquake is not likely to cause much damage. Generally, earthquake of magnitudes higher than 5 is considered destructive in nature.

18. *Suggest three measures to protect ourselves from lightning.*
    a. Protective measures against lightning are as follows:
        i. Stay in a completely closed place. If you are moving in a car, then remain there until the lightning is over. Close the windows of the car immediately.
        ii. Do not touch any electrical wires, telephone cables, metal pipes, etc.
        iii. Do not bath in running water. This may cause an electric shock.
19. Explain why a charged balloon is repelled by another charged balloon whereas an uncharged balloon is attracted by another charged balloon?
    a. The nature of charges present on the surface of charged balloons are similar. Since like charges repel each other, two charged balloons repel each other. When a charged body is brought near an uncharged body, the uncharged body acquires charges on its surface caused by the induction of charges. The charges are of opposite nature in relation to the charged body. Since unlike charges attract each other, a charged body always attracts an uncharged body. Hence, an uncharged balloon is attracted by another charged balloon.
20. Describe with the help of a diagram an instrument which can be use to defect a charged body.
    a. An electroscope can be used to detect whether a body is charged or not. The following figure shows a simple electroscope (fig 17.4 page no. 213). It consists of a metal rod. At one end of the rod, two leaves of aluminium foil are fixed and at the other end. there is a metal disc. The leaves of aluminium foil are placed inside a conical flask and the flask is corked to isolate the leaves from air. When the metal disc is touched with a charged body, the aluminium strips move away from each other. This happens because some f the charges of the body are transferred to the strips through the metal rod. This method of charging a body is called charging by conduction. The nature of charges on both the leaves and the charged body are similar. Hence, both the leaves of the aluminium foil will move away from each other. If the body was .not charged, then the leaves of the foil would remain as they were before. They would not repel each other.
21. List three stales in India where earthquakes are more likely.
    a. The three states in India where earthquakes are more likely to strike are Jammu and Kashmir. Gujarat and Assam.
22. Suppose you are outside your home and an earthquake strikes. What precaution

would you take to protect yourself?

a. Suppose we are outside your home and an earthquake strikes us some of the precautions taken to protect ourselves are as follows:
   i. Try to find an open field away from tall buildings, installations, tall trees, and electric wires and poles.
   ii. If travelling in a bus or a car then do not come out when an earthquake strikes. Ask the driver in an open field.

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Topic: SOUND

SOUND: Sound is a form of energy which produces a sensation of hearing in our ears. Sound is produced when objects vibrate. We hear sounds from various sources like humans, birds, machines; televisions etc. sound travels in the form of waves.

PROPAGATION OF SOUND: Sound is produced by vibrating objects. The matter or substance through which sound is transmitted is called medium. It can be solid, liquid or a gas. When an object vibrates, it sets the particles of the medium around it vibrating. As a result, the adjacent particle gets displaced from its position. A series of compressions and rarefactions are set up in the air and sound is propapagated through the air. When these compressions and rarefactions reach the ear drum, it vibrates and we hear the sound. *Wave*: A wave is a vibratory disturbance in a medium which carries energy from one point to another. When a wave passes through a medium, the medium itself does not move along the direction of the wave, only the particles of the medium vibrate about their positions. There are two types of waves namely; longitudinal waves and transverse waves.

NATURE OF SOUND: Sound travels in the form of waves. Sound waves are longitudinal waves.

LONGITUDINAL WAVES: A wave in which the particles of the medium vibrate back and forth in the same direction in which the wave is moving called a longitudinal wave. The direction of vibration of the particles is parallel to the direction of wave. Longitudinal waves can be produced in solids, liquids and gases. The wave produced by compressing a spring is an example of longitudinal wave. A longitudinal wave travels through a medium forming compressions and rarefactions. A compression is a region of the medium in which particles are compressed i.e. particles come closer. A rarefaction is a

region of the medium in which particles are rarefied i.e. particles get farther apart than their normal distance. Compression is indicated by C and rarefaction by R.

TRANSVERSE WAVE: A wave in which particles of the medium vibrate about their mean position in a direction perpendicular to the direction of the propagation of wave is called transverse wave. These waves propagate in solids and liquids. The waves set up in water by dropping a stone and light wave are examples of transverse waves. A transverse wave passes trough a medium forming crests and troughs. A crest is a portion of the medium, which is raised temporarily above the normal position of rest of the particles of medium. A trough is a portion of the medium, which is depressed temporarily below the normal position of rest of the particles of the medium.

Vibration: It is a kind of rapid to and fro motion of an object about its central position e.g.

1. A stretched rubber band when plucked vibrates and produces sound.
2. Sound is produced when vocal cords of humans vibrate.

SOUND NEEDS A MEDIUM TO TRAVEL: Sound wave needs a medium like, air, water etc. for its propagation. It cannot travel through vacuum, which can be demonstrated by the following experiment.

EXPERIMENT: Take an electric bell and an air tight jar. The electric bell is suspended inside the air tight bell jar. The bell jar is connected to a vacuum pump, as shown figure (see text book). If we press the switch on we will hear the bell. Now start the vacuum pump. When air in the jar is pumped out gradually, the sound becomes fainter, although the same current is passing through the bell. As more and more air is taken out from the jar, sound becomes fainter and fainter.

When all the air has been removed from the bell jar, i.e. a vacuum has been created in the bell jar, no sound can be heard at all (though we can see the hammer striking the bell). It is clear from this experiment that sound waves cannot travel through vacuum. A medium is necessary to carry sound waves.

CHARACTERISTICS OF A SOUND WAVE: A sound wave can be described completely by five characteristics:

- Wavelength
- Amplitude
- Time-period

- Frequency and
- Velocity.

Consider a longitudinal sound wave by the vibrations of a tuning fork.

WAVE LENGTH: In a sound wave, the distance between the centers of two consecutive compressions or two consecutive rarefactions is called its wavelength. The S.I unit of measuring wavelength is meter. Wavelength is denoted by a Greek letter ƛ (lambda).

AMPLITUDE: The maximum displacement of the particles of the medium from their original undisturbed positions, when a wave passes through the medium, is called amplitude of the wave. Amplitude is used to describe the size of wave.

TIME-PERIOD: The time required to produce one complete wave is called time-period of the wave. It can also be defined as time taken to complete one vibration. Time-period is measured in seconds.

FREQUENCY: The number of complete waves produced in one second is called frequency of the wave. If 10 complete waves are produced in one second, then the frequency of the waves will be 10 hertz. The S.I unit of frequency is hertz written as Hz. 1 hertz is equal to 1 vibration per second. 1 kHz = l000Hz. The frequency of a wave is denoted by /. Some times frequency is denoted Greek letter *v* (nu).

The frequency of a wave is the reciprocal of its time- period.

Frequency = 1/Time period or f = 1/t

VELOCITY: The distance traveled by a wave in one second is called velocity of the wave. The S.I unit of velocity of wave is meter per second.

RELATION BETWEEN VELOCITY, FREQUENCY AND WAVELENGTH OF A WAVE

Suppose a wave travels a distance lambda (ƛ) which is its wave length in time t then velocity of wave is distance divided by time i.e., v = distance/time

Or v= ƛ/t

v = ƛ . 1/t

v = ƛ f (f = 1/t)

In other words, velocity of a wave = wavelength frequency This is known as wave equation.

CHARACTERISTICS OF SOUND:

A sound has three characteristics: loudness, pitch and quality (or timbre)

LOUDNESS: The loudness of sound is a measure of the sound energy reaching the ear per second. The loudness of sound depends on the amplitude of sound waves. If the sound waves have small amplitude, then the sound will be faint or soft. On the other hand, if the amplitude is large then sound will be loud. When a table is stroked lightly, less energy is supplied, table vibrates with small amplitude and a soft sound is produced. When table is stroked hardly, greater energy is supplied; table vibrates with large amplitude and hence produces a loud sound. Loudness is measured in (decibel) written as dB. The softest sound is zero dB.

PITCH: Pitch is that characteristics of sound by which we can distinguish between different sound of same loudness. The pitch of a sound depends on the frequency of vibration. Sounds of low frequency have low pitch and sounds of high frequency have high pitch. A man's voice and a woman's voice differ in pitch. A man's voice is flat having low pitch, whereas a woman's voice is shrill having a high pitch.

QUALITY OR TIMBRE: It is that characteristic of musical sound which enables us to distinguish between the sounds of same pitch and loudness produced by different musical instruments. This characteristic depends on the shape of sound wave. The sounds produced by different musical instruments like violin, piano, sitar, etc. can be distinguished by their quality. The singing sound of singers such as Lata Mangeshkar, Nusrat Fetch Ali Khan, Daler Mehndi etc can be distinguished on the basis of their quality.

SPEED OF SOUND: The speed of sound is different for different mediums. The speed of sound depends on properties of medium through which it travels. It also depends on the temperature and pressure of the medium. The speed of sound decreases as we go from solid to gaseous state. Speed increases if we increase the temperature of the medium e.g., the speed of sound in air is 331m/s at 0°C and 344m/s at 22° C . In general, sound travels slowest in gases, faster in liquids and fastest in solids.

INTENSITY OF SOUND: The amount of sound energy passing each second through unit area is called the intensity of sound.

SONIC BOOM: When the speed of any object exceeds the speed of sound it is said to be traveling at supersonic speed. Bullets, jet air crafts etc. travel at supersonic speeds. Due to this very high speed, a supersonic aircraft produces extremely loud sound waves called shock waves in air. These shock waves

carry a large amount of energy. The air pressure variation caused by the shock waves produce a loud burst of sound called sonic boom.

REFLECTION OF SOUND: The bouncing back of sound when it strikes a hard surface is called reflection of sound. Hard, solid surfaces are best reflectors of sound. Sound is reflected well from surfaces like a wall, a metal, stones etc. Soft surfaces are bad reflectors of sound. Soft surfaces absorb sound. Sound is reflected in the same way as light. The laws of reflection are obeyed during reflection of sound.

EXPERIMENT: Take two identical tubes about 50cm long and 3cm wide and a drawing board which acts as reflecting surface. Adjust the tubes on a table such that the tubes should not touch the card board. Keep a clock near the open end of one tube. The clock makes a ticking sound. The sound waves pass through the tube T_1 get reflected from the drawing board and then enter the other tube T_2 . Adjust the position of the tubes so that we hear best ticking from the other end of second tube. Draw normal at the reflecting surface of drawing board. Measure the angle of incidence of sound (AON) and also measure angle of reflection (BON) . The angle of incidence will be equal to the angle of reflection. Moreover, the incident waves OA and the reflected wave OB and normal ON lie on same plane. From this experiment we conclude that sound obeys the laws of reflection of light.

ECHO: The repetition of sound caused by the reflection of sound waves is called an echo. When a person shouts in a big hall, we first hear his original sound. After a little while, we hear the reflected sound of shout. This "reflected sound" is an echo.

MINIMUM DISTANCE TO HEAR ECHO: It has been estimated by scientists that if two sounds reach our ears within an interval of $l/10^{th}$ of a second, then we cannot hear them as separate sounds. The human ear can hear two sounds separately only if there is a time interval of 1/10th of a second or more between the two sounds. Thus an echo can be heard if there is time interval of 1/10th = 0.1 sec between original sound and reflected sound. The speed of sound is 344m/s in air at 22°C. The distance covered by sound in 1 sec is 344m. now for an echo, time interval is 0.1 sec so, distance covered by sound in 0.1 sec = 344 X 0.1 - 34.4m .Thus, for hearing echoes , the minimum distance of the obstacle from the source of sound must be half of this distance that is, 34.4/2 = 17.2m. Thus at 22°C, we should be 17.2m away from the sound reflecting surface like

a wall.

REVERBERATION: The persistence of sound in a big hall due to repeated reflections from walls, ceiling and floor of the hall is called reverberation. A short reverberation is desirable in a concert hall (where music is being played) it gives life to sound and boosts sound level. But if the reverberation is too long, then the sound becomes blurred, distorted and confusing due to overlapping of different sounds. The excessive reverberation in big halls is reduced by types of sound absorbing materials To reduce reverberation the following methods are applied:

(a) Roof and walls of the hall or auditorium are covered with sound absorbent materials like compressed fireboard, curtains, carpets etc.

(b) Carpets are put on the floor to absorb sound.

(c) Heavy curtains are put on doors and windows to absorb sound.

RANGE OF HEARING IN HUMANS: The sounds in our environment have different frequencies. The sounds of all frequencies cannot be heard by the human beings. The range of frequency from 20hertz to 20000 Hz is known as the frequency range of hearing in humans. The sound which we are able to hear is called audible range. The audible range of sound frequencies for human ear is from 20hertz to 20000hertz. Thus human ear can't hear sounds which have frequency less than 20hertz or greater than 20000hertz. INFRASONIC SOUNDS: The sounds of frequencies lower than 20hertz are known as infrasonic sounds. These are low frequency sounds. Infrasonic sounds are produced by those objects which vibrate very slowly. For example, a vibrating simple pendulum produces infrasonic sounds which we cannot hear. Earthquakes and some animals like whales, elephants and rhinoceroses also produce infrasonic sounds. It is observed that some birds and animals start running here and there just before the earthquake occurs. This is because^ before main shock waves, the earthquake produces low-frequency infrasonic sounds which some animals can feel / hear and get disturbed.

ULTRASONIC SOUNDS: The sounds of frequencies higher than 20000hertz are known as ultrasonic sounds. These are high frequency sounds. Ultrasonic sounds cannot be heard by human beings. Dogs can hear sounds of frequency up to 50000 hertz. Monkeys, deer, cats, dolphins can hear ultrasonic sounds. Bats can hear sounds having frequencies up to 120000hertz. Bats can also produce ultrasonic sounds while screaming. We cannot hear screaming of a bat

because its screams have frequency much higher than 20000hertz which is beyond our limit, of hearing. Children under the age of 5 years can hear ultrasonic sounds of frequency up to 25000hertz.

APPLICATIONS OF ULTRASOUND: The ultrasound is reflected just like ordinary sound waves and produces echoes. Due to its very high frequency, ultrasound has a much greater penetrating power than ordinary sound. It is therefore used to detect objects under sea and organs inside human body. Some of the uses of ultrasound are described as:

(1) Ultrasound can be used to detect cracks or flaws in metal blocks. Metallic blocks are used in construction of big structures like buildings, bridges etc. The cracks or holes inside the metal blocks which are invisible from outside reduce the strength of the structure. Ultrasonic waves are allowed to pass through the metal block and detectors are used to detect the transmitted waves. If the ultrasound waves pass through the block uninterrupted, then the metal block is flawless or defect free. If, however, ultrasound waves are not able to pass through a part of the metal block and gets reflected back, then there is a flaw or defect in the block like a crack or a hole.

(2) Ultrasound may be used to break stones formed in the kidneys into fine grains. These grains later pass out with urine.

(3) Ultrasound scanner is used to monitor the development of fetus (unborn baby) during pregnancy and scanning of organs like liver, gall bladder, kidney and heart. Ultrasound waves travel through the tissues of the body and get reflected from a region where there is any change in the density of tissues. These waves are converted into electrical signals that are used to generate images of the organ. These images are then displayed on a monitor or printed on a film. This technique is called ultrasonography. Ultrasonography is used for the examination of fetus during pregnancy to detect any growth abnormalities. The use of ultrasound waves to investigate the action of heart is called echocardiography.

(4) Ultrasound is used to clean "hard to reach" parts of objects such as spiral tubes, odd shaped machines etc. the object to be cleaned is placed in a cleaning solution and ultrasound waves are passed into the solution. Due to their high frequency, the ultrasound waves stir up the cleaning solution. The particles of dust and grease sticking to the dirty object vibrate too much, become loose get detached from the object and fall into the solution. In this way the object gets

cleaned thoroughly.

SONAR: The word "SONAR" stands for "Sound Navigation And Ranging." Sonar is an apparatus which is used to find the depth of a sea or to locate the underwater things like shoals of fish, shipwrecks, and enemy submarines.

WORKING: Sonar consists of two parts:

(a) Transmitter

(b) Receiver

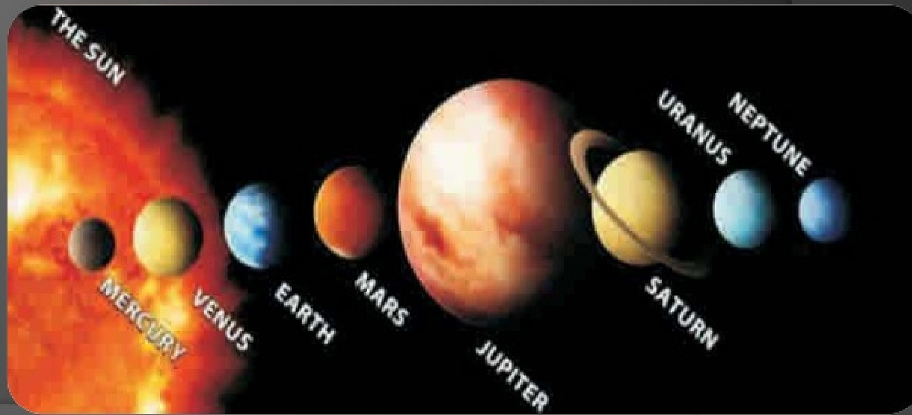
Sonar is attached to the under-side of a ship. The transmitter emits an ultrasonic wave with a high frequency of about 50000 hertz. This ultrasound wave travels down the sea -water and after striking the object on the .sea bed, gets reflected back in the form of an echo. This echo produces an electrical signal in the receiver part of the sonar. The distance of the object that reflected the sound wave can be calculated by knowing the speed of sound in water and the time interval between transmission and reception of ultrasound. The sonar gives the measure of the time taken by the echo to return to the ship. Half of this time is the actual time taken by ultrasound from the ship to the object. Let the time interval between transmission and reception of ultrasound signal be T and the speed of sound in sea water be V.If the distance is d then total distance will be 2d then, $2d = V \times T$. This method is called echo-ranging. The sonar is used to determine the depth of the sea and to locate under water hills, valleys, submarine, icebergs etc.

BATS USE ULTRASOUND: Bats emit high- frequency ultrasonic squeaks while flying and listen to the echoes produced by the reflection of their squeaks from the prey like a flying insect. From the time taken by the echo to be heard, bats can judge the distance of the prey and hence catch it. The nature of reflections tells the bat whether the obstacle is prey or something else.

THE HUMAN EAR: The ears are the sense organs which help us in hearing sound. The ear consists of three compartments: outer ear, middle ear and inner ear. The part of ear which we see outside the head is called outer ear. The outer ear consists of a broad part called pinna and about 2cm to 3 cm long passage called ear canal. At the end of ear canal is a thin, elastic and circular membrane called ear-drum or tympanum. Middle ear contains three small bones called hammer, anvil and stirrup. The inner ear has a coiled tube called cochlea. One end of cochlea is connected to the middle ear and the other to auditory nerve

which goes into the brain.
WORKING OF HUMAN EAR: The sound from the surroundings is collected by the pinna of outer ear. These sound waves pass through ear canal and fall on the ear drum. When the compression of sound wave strikes the ear -drum, the pressure on the outside of ear drum increases and pushes it inwards. When rarefactions fall on ear drum, the pressure on outside of ear- drum decreases and it moves outwards. Thus ear drum starts vibrating back and forth. The vibrating ear drum causes small bone hammer to vibrate. Vibrations are passed to second bone anvil and finally to the third bone stirrup. The function of three bones is to amplify (make stronger) the vibrations of ear drum. The vibrations are passed to a liquid in the cochlea. The vibrating liquid of cochlea sets up electrical signals in the nerve cells and sends these signals to the brain. The brain interprets these signals as sound and we get the sensation of hearing.
(Diagram on book)

8^{th} Science



Introductio

- The v the earth and ar
- The b enly bodies is calle
- People

Celestial ob

- The ol

objects For example:

Planets and their moons, asteroids, comets, meteoroids, stars.

Moon

- A celestial body revolving around a planet is known as a satellite.

- All the planets except mercury and venus have natural satellite.
- In 1969, the American astronaut, neil armstrong landed on the moon for the first time, followed by edwin aldrin. They found the moon's surface to be dusty and barren. Craters, up to hundreds of kilometres wide cover its surface

- As there is no atmosphere to trap heat, the temperature on the moon is extreme, ranging from 100c at noon to -173c at night

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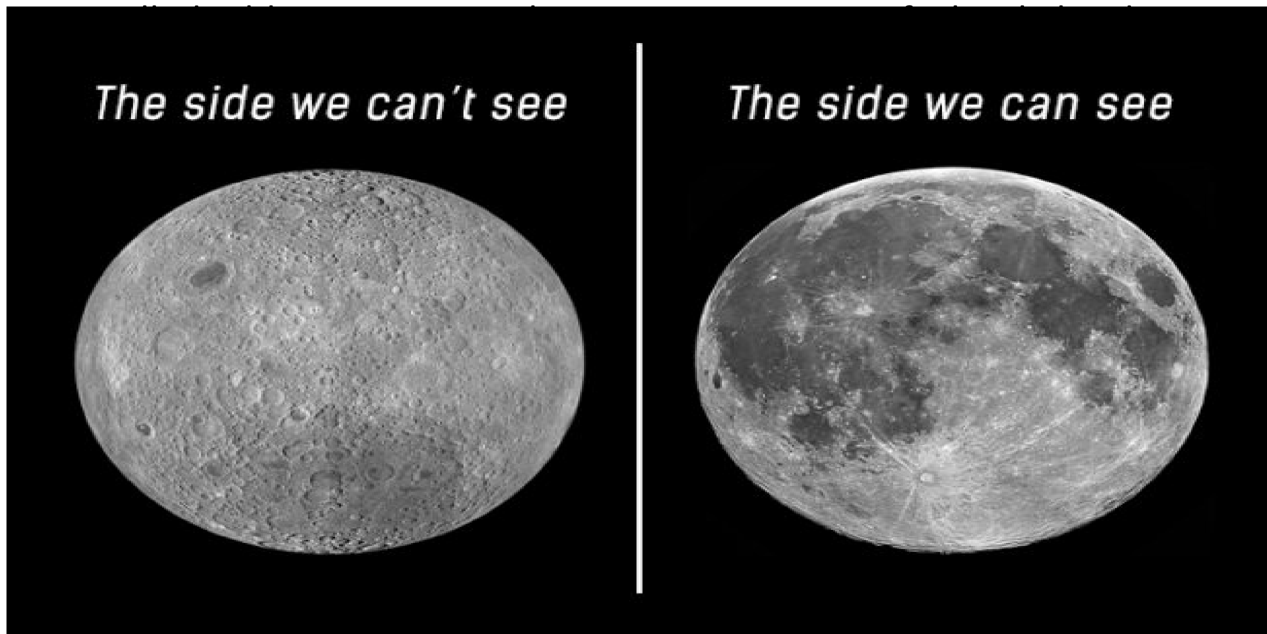
- The moon is the earth's only natural satellite and it reflects the sunlight incident on it.
- It takes 29.5 days for the moon to rotate around the earth

Phases of the moon

- The side of the moon that faces earth is called the near side
- The opposite side is called the far side.

Different phases of moon are :-

- New Moon:- When the moon is in between the earth and the sun then the side of the moon, lit by the sun is away from the earth. In this position, we do not see the moon at all.
- Crescent Moon:- We can see a small sun-lit portion of the moons surface.
- First Quarter:- Within a week, we see half of the moon.
- Gibbous Moon:- When we see more than half of the moon it is



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Phases of moon and moon's light

- We are able to see the moon because the sunlight falling on the moon is reflected towards the earth
- The day on which the moon is not visible is called the "New Moon Day"
- The day on which the whole bright disc of moon is visible to us is called "Full Moon Day".
- We have one new moon and one full moon day during a month.
- As moon revolves around the earth once every month and moves a ... –lit s ... the a



THE SOLAR SYSTEM

Our solar system consists of the sun and the eight planets. The eight planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Besides planets, the solar system consists of a large number of minor planets or asteroids, a host of comets and meteors. The gravitational pull (attraction) between the sun and these celestial bodies keep all of them revolving around it.

SUN

The solar system is dominated by the Sun, which accounts for almost 99.9% of the matter of the whole system. The Sun is also the source of almost all the energy in the solar system. The Earth receives almost all its energy (heat and light) from the sun.

The Sun is essentially a sphere of hot gases. The temperature of the bright disc (visible), which is the source of energy for us is about 6,000 K. The disc is called the photosphere. The radius of the Sun is almost 100 times the radius of the earth and its mass is about a million times the mass of the earth.



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PLANETS

The name planet has been given to all those (bright) heavenly bodies that revolve around the sun. They look like star s but they do not twinkle. Their observed brightness is only due to the light of the sun reflected by them.

There are eight planets in our solar system. They move in elliptical-shaped paths called orbits, around the sun. The eight planets of our solar system, in increasing order of distances from the sun, are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. The planets are divided into two categories:

1. The Terrestrial Planets

2. The Jovian Planets

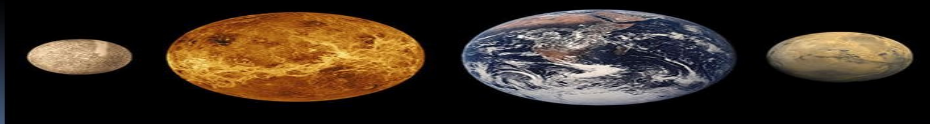
Mercury, Venus, Earth and Mars are the Terrestrial planets. They have solid and rocky surfaces.

The Jovian planets are Jupiter, Saturn, Uranus and Neptune. These planets are very large in size and are made up largely of gases.

Planet	Diameter (km)	Distance from Sun (x10 6 km)	Surface temperature (°C)	Density (g/cm 3)	Main atmospheric constituents
Sun	1,392,000	-	5,800		-
Mercury	4,880	58	260	5.4 (rocky)	-
Venus	12,100	108	480	5.3 (rocky)	CO2
Earth	12,750	150	15	5.5 (rocky)	N2, O2
Mars	6,800	228	-60	3.9 (rocky)	CO2
Jupiter	143,000	778	-150	1.3 (icy)	H2, He
Saturn	121,000	1,427	-170	0.7 (icy)	H2, He
Uranus	52,800	2,869	-200	1.3 (icy)	H2, CH4
Neptune	49,500	4,498	-210	1.7 (icy)	H2, CH4
Pluto	2,300	5,900	-220	2.0	CH4

The Inner Planets

- Terrestrial
- High temperatures
- Closer to the Sun
- Closer to each other



Outer Planets

- Gas giants
- No solid surface, just thick atmosphere
- All very large
- Very far apart from each other
- All have rings



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Smallest to largest

Mercury, Mars, Venus , Earth , Neptune , Uranus, Saturn, Jupiter.

Mars

Its distance is 227 × 106 km from the sun.

It takes 687 days to complete one revolution around the sun and 24 hours to complete one rotation on its axis.

It has a reddish appearance.

It has two natural satellites or moons named phobos and debos. Unlike Mercury and Venus it can be seen in any part of the night sky.

nce

Mercury (Budh)

Mercury lies closer to the sun than any other planet. It is a dry, hot and virtually airless planet. It has craters like the moon, but its interior is similar to that of the earth. Like the earth, its interior contains iron and other heavy elements.

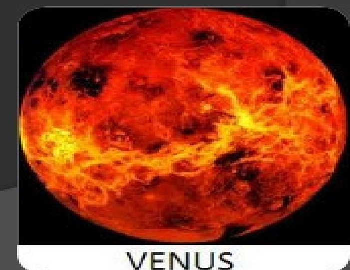
Mercury is much smaller in size than the earth. It is occasionally visible just before sunrise or immediately after sunset. Hence, it is often known as the morning or evening star. Being close to the sun, it takes only 88 earth days to go once around the sun.

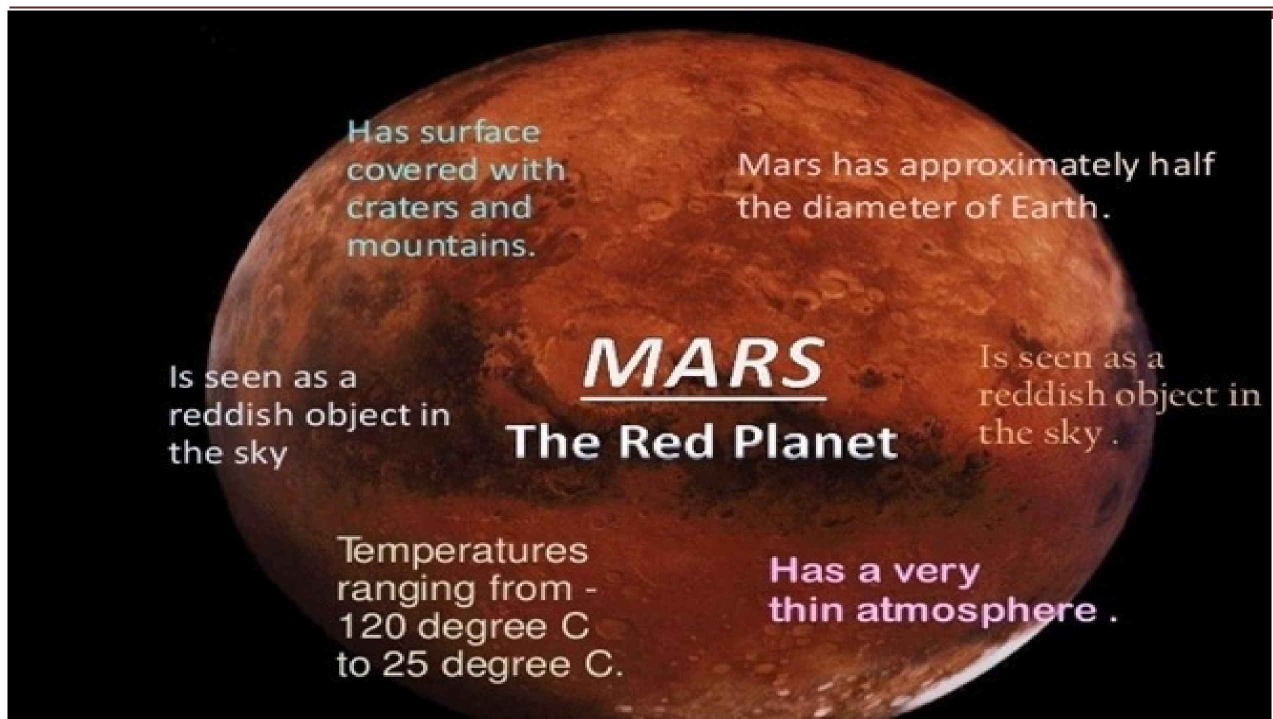


Venus (Shukra)

Venus is the brightest objet in our sky after the sun and the moon. Its bright appearance is due to its cloudy atmosphere which reflects almost three- fourth of the sunlight falling on it. Venus is almost the same size as the earth but rotates relatively slowly around its axis. It rotates from east to west while the earth rotates from west to east. It has no moon or satellite of its own.

Venus is even hotter than mercury though it is relatively farther away from the sun. This is because of the high percentage of CO_2 in its atmosphere. Venus is also known as a morning or evening star as it is usually visible only during these times. It also shows phases like the moon.





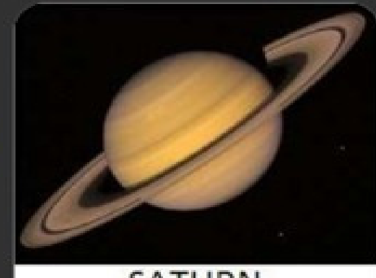
Jupiter (Brihaspati)



Jupiter is the largest of all planets. Its volume is 1,300 times more than that of the earth. It shows its own colouful bands. These are believed to be due to its strong atmospheric currents and the dense cloud- cover around it.

Jupiter consists mainly of hydrogen and helium in gaseous form. Its cloud-cover is made up of methane, in gaseous form, with some ammonia in crystalline form. Till date, Jupiter is known to have 28* moons.

Saturn (Shani)



Saturn is quite similar to Jupiter in size, mass and composition. It is the second largest planet of the solar family. It is distinguished by its very unique and special system of rings. These rings give it a beautiful appearence. These rings can be seen clearly only with the help of telescope. Saturn is also known to have 30* natural satellites or moons of its own. This planet has the largest numbers of moons amongst all the planets.

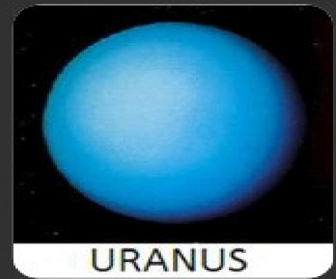
* The number of moons of the Jovian planets keeps on changing. With the improvement in observing techniques, many new moons may be discovered.

Light year

- The distance between celestial objects is described in light years.

Uranus (Arun)

Uranus is also a very large planet. In fact, it is the third largest planet of the solar system. Its diameter is almost four times of than that of the earth. That means it can contain as many as (nearly) 64 earths in it. Hydrogen and methane have been detected in the atmosphere of this planet.



This planet is observed to have blue-green colours. This is believed to be because of the presence methane gas in its cold, clear atmosphere. Its northern hemisphere remains in a four-decade long period of darkness because of the way the planets rotates. So far 21* satellites or moons of Uranus have been discovered.

Neptune (Varun)

Neptune is very far away from the sun and is visible only through a telescope. It has been named after the Roman sea god Neptune. Neptune has 8* satellite revolving around it.



We do not have much detailed information about this planet. This is mainly because of its very large distance from the earth as well as from the sun.

* The number of moons of the Jovian planets keeps on changing. With the improvement in observing techniques, many new moons may be discovered.

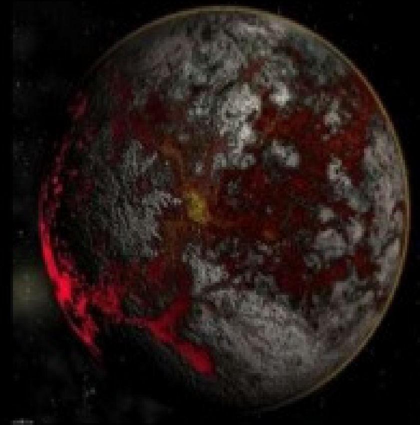
ASTRONOMICAL UNIT (A.U.)

Astronomical unit (A.U.) is a unit for measuring distance and sizes of celestial objects.

- One A.U. is equal to the mean distance between the earth & the sun
- i.e. 1 A.U. = 1.5×10^{11} m

Alpha Centauri

The nearest star to the Earth (apart from the Son) is 'alpha centauri'. The distance of Alpha Centauri is 4.3 light years away from the Earth. Let find the actual distance of Alpha Centauri from the Earth in kilometres.



We know, 1 light year = 9.46×10^{12} km

So, 4.3 light years = $4.3 \times 9.46 \times 10^{12}$ km

= 40.67×10^{12} km.

SOME OTHER MEMBERS OF THE SOLAR SYSTEM

There are some other bodies which revolve around the Sun. let us learn about some of them :

1. asteroids
2. Comet
3. Meteors
4. Meteoroids
5. meteorites

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Comet

- Comets are big pieces of ice and rock that also revolve around the sun in elliptical shaped orbits.
- Comets are the leftover pieces of rocks that were formed at the time when the solar system was beginning its formation.
- Comets are often observed to have a tail. This tail appears as a

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Meteoroids and Meteors

- The asteroids in the space sometimes collide with each other and form meteoroids. Hence the small pieces of an asteroid can be called as meteoroids.
- From these meteoroids, meteors are formed.
- When a meteoroid enters the atmosphere of the earth it appears as a streak of light in the sky or a meteor. The meteors generally have high speed as they enter the atmosphere. Thus, they get heated up due to the friction of the atmosphere.

- Hence ,the meteors light up as a streak of light. However, they get evaporated in the sky before reaching the earth's surface and this streak of light is therefore visible for a short time span only.
- Meteors are also called shooting stars because of their characteristic feature however they are not stars but just a piece of rock.



Constellation

A constellation is described as a group of stars that form a recognizable shape or pattern.

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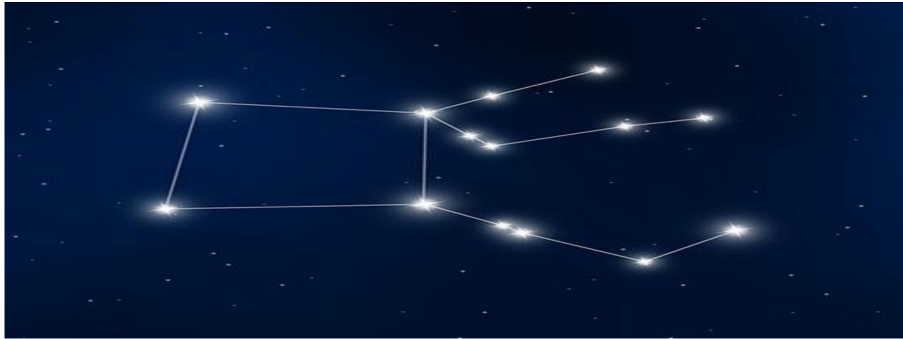


Ancient people used constellations as a way to recognize the stars.
The shape of the constellations generally resembles with objects that ancient people used.

Major Constellation

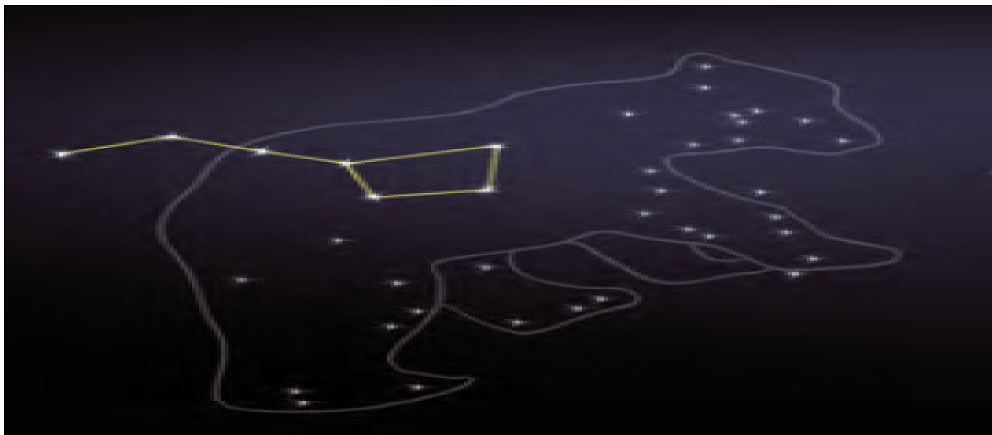
Ursa Major or The Great Bear or Saptarishi or The Big Dipper :-

This constellation comprises of seven major stars.
These stars form the shape of a big question mark or a ladle.
The handle of the ladle is made by joining the 3 stars in a row and the remaining four stars are in the shape of the bowl of the ladle.
Ursa Major is also called Great Bear because the seven bright stars of Ursa Major along with several other fainter stars form a pattern resembling a bear.



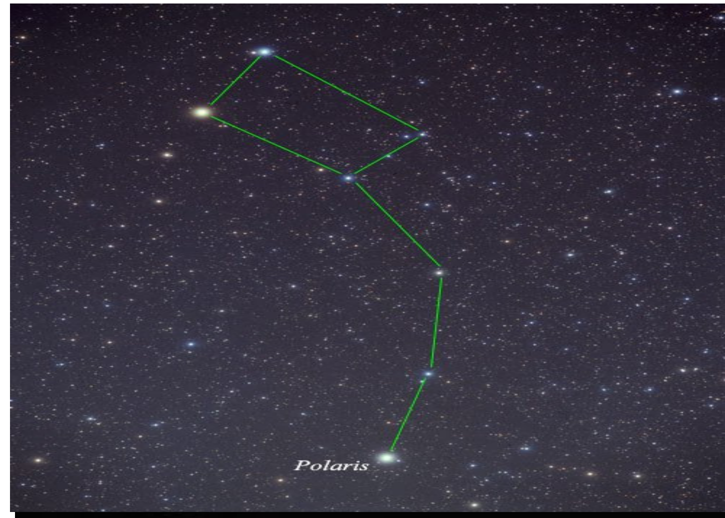
- It is one of the most famous constellation which can be seen clearlyapril in summer season in the northern part of the sky at night.

Also known as “ big dipper “, the great bear or the saptarishi



Ursa Minor

- Ursa minor also known as the little bear , is a constellation in the northern sky
- Like the great bear , the tail of the little bear look like the handle of a ladle
- The brightest stars from a shape that is also known as the little dipper.
- It was one of the 48 constellation.
- It contains the north celestial pole and the polar star polaris.



- It is one of the most magnificent constellations of the sky.
- It comprises of 7 or 8 bright stars.
- There are three stars in the middle that appear as the belt of hunter.
- The remaining four stars are arranged in the form of a quadrilateral.

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- The Orion constellation is visible to us in the sky during winter season.

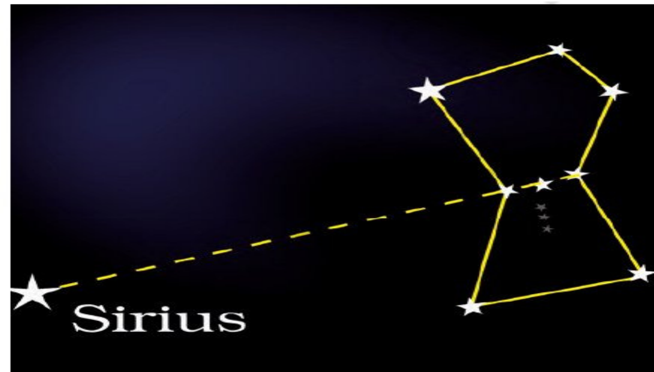
Sirius Star

- The Sirius star is the brightest star of the sky.
- It can be located with the help of the Orion constellation.

If we draw an imaginary line through the three stars in the middle of the Orion and extended further we will reach the brightest star, Sirius

Cassiopeia

- It is a constellation found in the northern hemisphere and can be located in the sky during the winter season at the beginning of the night.
- The shape of this constellation resembles with a w or a distorted m.



- The name of this constellation was given after queen cassiopeia in greek mythology.
- Cassiopeia constellation consists of 5 main stars

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Stars

The stars are celestial bodies comprising of hot gases (mainly helium and hydrogen) all the stars emit their own light. All the stars are not the same. They may vary in brightness, size, colors, and temperature. They are massive in size however they appear as a point-sized object from the earth's surface. This is so because they are at a huge distance from the earth.

Stars have a life period. They take millions of years to born and live for tens of millions of years and eventually come to an end. Due to their long lifespan, the changes in the stars are not very sudden. Hence, they appear as permanent to us.surface temperature of stars determine colour of stars. Stars with low temperature appear red stars with high temperature appear white. Stars with very very high temperature (hottest stars) appear blue. Sirius is the brightest star in the night sky after sun

What are the differences between stars and planets?



BASIS FOR COMPARISON	STARS	PLANETS
Meaning	Stars are the astronomical objects, that emit their own light, produced due to thermonuclear fusion, occurring at its core.	Planets refers to the celestial object that has a fixed path (orbit), in which it moves around the star.
Light	They have their own light.	They do not have their own light.
Position	Their position remain unchanged.	They change position.
Size	Big	Small
Shape	Dot shaped	Sphere-shaped
Temperature	High	Low
Number	There is only one star in the solar system.	There are eight planets in our solar system.
Twinkle	Stars twinkle.	Planets do not twinkle.
Matter	Hydrogen, Helium and other light elements.	Solid, liquid or gases, or a combination thereon.

Pole Star

Significance of pole star

The pole star also called as polaris is situated close to the earth's axis of rotation. Asresult, the position of the pole star appears to be fixed.

THE STAR WHICH APPEARS STATIONARY FROM THE EARTH IS CALLED POLE STAR.

It is special star present in the Northern hemisphere.

The pole star appears to be stationary & does not change its position with time because it lies on the axis of rotation of the earth

It helps travellers to find direction at night.







ARTIFICIAL SATELLITES

- **The artificial satellites** are man-made. They are launched from the **Earth**. They revolve around the Earth much closer than earth's natural satellite.
- **Artificial satellites** have many practical applications. They are used for **forecasting weather**, **transmitting television** and **radio signals**. They are also used for **telecommunication** and **remote sensing**.





How artificial satellite is different from a natural satellite.

ARTIFICIAL SATELLITES BY INDIA



- **India** has built and launched several artificial satellites. **Aryabhatta** was the first Indian satellite.
- Some other Indian satellites are **INSAT**, **IRS**, **Kalpana-1**,**EDUSAT**, etc





Natural Satellites	Artificial Satellites
They are formed by nature	They are man-made
They are not controlled by humans	They are controlled by humans
They are permanent	They are temporal
They are not used for communication	They can communicate with instruments on earth

Textual questions

Q1. Fill in the blanks by choosing correct words from the following list:

(Meteorite, Pluto, Moon, Planets, Universe, Core, Comet, Constellation)

(i) The branch of science which deals with the study of universe is called astronomy.

(ii) The unburnt part of the meteor which reaches the earth is called meteorite.

(iii) The heavenly bodies which revolves around the sun are called planets.

(iv) The heavenly bodies which revolves around the planets are called moons.

(v) The orbit of Pluto is not in the same plane as that of the other planets.

(vi) A heavenly body with long tail, moving around the sun in an elliptical path is called comet.

(vii) in the core of the sun, hydrogen gas fuses with the liberation of the energy.

(viii) a group of stars which resembles an animal or some other known object is called constellation.

Q2. Statements given below are incorrect. Write correct statements.

(i) Halley's comet visits our solar system after 26 years.

Ans. Halley's comet visits our solar system after 76 years

(ii) Helium gas contains most of the atmosphere of the sun and the stars.

Ans. Helium gas constitutes most hydrogen gas.

(iii) Pole star is nearest to our solar system.

Ans. Pole star is a part of constellation.

iv) Astronomers have divided the sky into 68 constellations.

Ans. Astronomers have divided the sky into 88 constellations

(v) Meteors on burning leave behind gold, dust and light

Ans. Meteors after burning disappear.

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(vi) The orbit of Neptune is different from the orbits of the other planets in the solar system.

Ans. The orbit of Pluto is different from the orbits of the other planets in the solar system.

(vii) Mars is the second planet nearest to the sun.

Ans. Venus is the second planet nearest to the sun.

(viii) Moon revolves around the earth in 21 ½ days.

Ans. Moon revolves around the earth in 27 days 7 hours 43 min 11.5 seconds.

Q3. Answer the following questions:

(i) What is universe? Name six different kinds of heavenly bodies found in the universe.

Ans. The universe is the vast unimaginable space composing many heavenly bodies such as, planets, stars, sun, constellations, comets, meteors etc.

(ii) With reference to the average distance of the sun, state:

(a) The serial number of the planet earth.

Ans. The serial number of planet earth is 3.

(b) The average distance of the earth from the sun.

Ans. The average distance of the earth from the sun is 149,600,000 kilometers

(c) The time in which sunlight reaches the earth.

Ans. Sunlight takes 8 minutes to reach the earth.

(iii) (a) name the natural satellite of the earth.

Ans. Moon is the natural satellite of the earth.

(b) In how many days does the satellite complete one revolution around the earth?

Ans. Moon is the satellite of the earth. It completes one revolution in 27 days 7 hours 43 min 11.5 seconds.

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c) In how many days does the satellite rotate around its own axis.

Ans. Moon takes 27 days to rotate on its own axis.

(d) How does the gravity of this satellite compare with the earth.

Ans. The gravitational pull of moon is one-sixth that of the earth.

(e) State the maximum temperature on the day side and minimum temperature on the night side of this satellite.

Ans. On the day side of the moon, the temperature as high as $110^{o}c$ and on night side of the moon the temperature could be as low as $–150^{o}c$.

(iv) What do you understand by the following terms?

(a) New Moon

Ans. After the completion of one revolution around the earth the moon comes in between the sun and the earth and is not visible at that time, hence we see darkness, this is called the new moon day. It is formed before the crescent

(b) Full Moon.

Ans. When the earth comes in between the moon and the sun, the moon appears to be full with bright light, this is called full moon day. It appears on the fifteenth day from the new moon day.

(v) (a) Define Solar System.

Ans. The sun along with the eight planets and their moons constitute the solar

system.

(b) Name all the planets in the solar system in the order of their distance from the sun.

Ans. Following are the names of the planets as per their distance from the sun:

1. Mercury 2. Venus 3. Earth 4. Mars 5. Jupiter 6. Saturn 7. Uranus 8. Neptune

Earlier Pluto was the ninth planet, which is now said to be vanished from the solar system.

Meteors

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1. Consists of rocks metals and dust

2. Produces heat and light energy due to the friction of earth's atmosphere.

3. Meteors are very small pieces of rocks.

Stars

4. Meteors last for few seconds.

1. Consists of hydrogen and helium.

2. Produces heat and light energy due to fusion and hydrogen.

3. Stars are extremely big.

4. Stars last for billions of years.

B) How are meteors different from meteorites?

Ans. Meteors are shooting stars that produce heat and light energy due to the friction of earth's atmosphere.

The unburnt piece of a meteor, which reaches the surface of earth is called meteorite. Its size is from size of small pebbles to several tons of rock and metal

(vi) (a) How many moons mars have?

Ans. Mars have 2 moons.

(b) Write the names of these moons.

Ans. Phobos and deimos are the two moons of the mars.

Rite. Its size is from size of small pebbles to several tons of rock and metal

(vii) What is comet? Why does a comet develop a tail while approaching the sun?

Ans. The bright 'star like' object with a long tail approaching the sun in a highly elliptical orbit is called comet. It is a small icy celestial body. The nucleus of comet consists of solid frozen ice, gas and dust. When the comet approaches the sun, the particles with in the nucleus get deflected

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due to heat radiations of the sun and it increases when it reaches close to the sun giving rise to a tail like structure.

(viii) What is star? What makes the star give about vast amount of energy?

Ans. A star is a giant ball of hydrogen gas with a bright light and heat. Due to the fusion of hydrogen gas, a heavier gas, i.e., helium, is formed which lubricates a huge amount of heat and energy. So this is due to the fusion of hydrogen gas that the star gives about a vast amount of energy.

Additional Textbook Questions

Q1. What are celestial bodies? Name any three celestial bodies.

Ans.Celestial bodies are the heavenly bodies found in the universe. Moon,
Planets, Sun, Stars, Meteors, Comets etc. Some Celestial Bodies.

Q2. Why do you classify the sun as star?

Ans. Stars emit heat and light due to the fusion of hydrogen. Sun also emits a
huge amount of light and energy due to the fusion of hydrogen and the formation of helium gas. Hence sun is called a star.

Q3. Why do the stars appear like point objects?

Ans. The stars appear like point objects because they are very far away from us
i.e., earth, on which we live. It is only the sun which appears bigger to us because it is nearest to earth.

Q4. What is a constellation? How does a constellation differ from a star?

Ans. A group of stars which forms a recognizable pattern or shape is called a constellation. A star is a giant ball of hot gases like hydrogen or helium, while as constellation is a group of stars.

Q5. Name a star which appears stationary from the earth. In which constellation is it situated?

Ans. Pole star appears stationary from the earth. It is situated in ursa minor constellation.

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Q6. What is "a light minute"? How many light minutes is the earthy from the sun? Express this distance in kilometers.

Ans. The distance travelled by the light at a speed of 300,000km/s in one
minute (60 seconds) is called a light minute.

1 light minute = 300,000 km/s x 1 minute

= 300,000 km/s x 60s

= 1800000 km = 18 x 106 km

Q7. How much time is involved from one new moon to another new moon as seen from the surface of the earth?

Ans. 29 ½ days of time is involved from one new moon to another new moon.

Q8. In how much time does the moon complete one rotation about its own axis?

Ans. Moon completes one rotation about its own axis in 27 days.

Q1. What is a planet? How many planets revolve around the sun?

Ans. A solid heavenly body which revolves around the sun in well-defined orbit is called planet. Recent studies say that there are eight planets revolving around the sun.

Q2. Name the planet which:

(i). Is nearest to the sun?

Ans. Mercury is nearest to the sun.

(ii). Is farthest from the sun?

Ans. Neptune is the farthest planet from the sun.

(iii). Supports life?

Ans. Earth supports life.

Q3. Name the planets which:

(i). Revolves around the sun from east to west.

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Ans. Earth is the planet which revolves around the sun from east to west.

(ii). Intersects the orbit of another planet?

Ans. Pluto intersects the orbit of neptune.

Q4. Name one planet that was predicted before its discovery?

Ans. Pluto was predicted as a planet before its discovery.

Q5. Name the planet having:

(i). Largest number of Moons?

Ans. Saturn has the largest number of moons. It has 30 Moons or Satellites.

(ii). A system of number of rings?

Ans. Saturn has a system of number of rings.

Q6. What is the solar system? Name all the planets of solar system in the increasing order of distance from the sun?

Ans. The sun along with eight planets, three plutons, and their moons constitute solar system. Following are names of planets of the solar system:

1. Mercury, 2. Venus, 3. Earth, 4. Mars, 5. Jupiter, 6. Saturn, 7. Uranus,
8. Neptune

- Plutons are:
- 1. Pluto, 2. Charon, 3. 2003 ub313s

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